ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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A Thesis Submitted to the School of Graduate Studies Of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Masters of Art in Regional And Local Development Studies (RLDS)

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Households' Willingness to Pay for Improved Water Supply in Combolcha Town, South Wollo

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Abbreviations

CSA: Central Statistics Authority

CV: Contingent Valuation

CVM: Contingent Valuation Method

FAO: Food and Agricultural Organization (of UN)

MoWR: Ministry of Water Resource

O&M: Operation and Maintenance

S.Co: Share Company

UN: United Nation

UNCHS: United Nations Center for Human Settlement

WHO: World Health Organization

WTA: Willingness to Accept

WTP: Willingness to Pay

Abstract

This paper tries to examine and analyze households' willingness to pay for improved water supply in Combolcha town, South Wollo Ethiopia. It also explores determinants of willingness to pay and examine the applicability of cost recovery strategy.

A contingent valuation method based on a single bounded dichotomous choice format followed by open ended question was employed. A total of 247 sample households randomly selected from all kebeles of Combolcha town were covered during the survey.

Responses to the valuation questions revealed that 98.6% of the respondents expressed their willingness to have private connection to the new improved water and are willing to pay for the new service with mean willingness to pay of 15.70 cents. This implies that, on average, the respondents are willing to pay birr 7.85 for one m^3 of improved water service which is greater than even twice of the town's highest consumption block.

Results of the probit model also show that income, initial bid, and attitude of the respondent for the responsibility of town water provision have positive effects and age of the head of the household has a negative effect on the households' choice for improved water services. This implies that households with high income are more likely to choose improved services. However, there is a tendency for aged households not to choose the improved water service. Mean willingness to pay for the probit model is 26.10 cents per 20 liters water, which implies that the mean willingness to pay for the new improved water supply ranges between 15.70 to 26.10 cents.

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Water is one of the basic necessities for sustainable and healthy life of human beings. In the history of mankind access to safe water has played an important role in supporting the socio-economic development of individuals in particular and the economic growth of nations in general.

In the past water has been regarded as a free good and every one has equal right of use. But, as a result of natural and rural urban migration caused population growth, the demand for water particularly in the third world countries has been increasing over time. And water now becomes a scarce resource.

Lack of access to good quality drinking water and sanitation lead to environmental health hazards, and largely contribute to the very low life expectancy in many African countries (Vaz L. et al., 2001). According to Water Aid (2007) some 1.1 billion people in developing countries (300 people in sub Saharan Africa) have inadequate access to water and almost two of every three people lack access to clean water provision. WHO (2004) also added that 1.8 million people died every year attributed to poor quality water and sanitation.

In Ethiopia, similar to other under developed nations, urban population is increasing in an alarming rate with corresponding rise in consumption levels that has gone beyond the capacity of governments to make available basic services such as clean and safe water (UNCHS, 2000).

The country has abundant water resources potentials: 110 billion m3 surface water and 2.96 billion m3 ground water (MoWR, 2004), but according to the 1994 second national CSA survey, only 24% of housing units in the country used safe source of

water: 14% through piped (tap) water, 10% from protected springs. The rest 76% of the population used unsafe water such as from unprotected springs and wells or directly from rivers (MoWR, 2004). As per the World Bank report (2004) 75% of the health problems in Ethiopia are due to communicable diseases ascribed to unsafe and inadequate water supply and unhygienic waste management as well.

Provision of sufficient supply of safe potable water is essential for life and serves to realize development ventures of nations and contributes to improved health and enhanced productivity of individuals, by reducing mortality, morbidity and illness.

1.2. Statement of the Problem

Urban water supply coverage in Ethiopia is judged to be fair (MoWR, 2004). Data revealed that (MoWR, 2004) 75% of the people in urban areas have access to tap water and 85% to protected water. What is low, however, is access to water close to home. Only some 4% have access to water in the house and another 23% have access to water in their own or a close by yard.

Various feasibility studies conducted on water supply development projects indicate that, though it varies with types of technology used and regions in which the project is implemented, provision of portable water supply to communities requires huge amount of investments. And for less developed countries, like Ethiopia, addressing the water need of all citizens solely through government effort is a bit cumbersome. In such circumstances to fill the gap and achieve full coverage of this basic service, planning for efficient and equitable and sustainable water delivery systems that ensure the proper and adequate water service provision is critical. Hence, it quite sensible to gear water provision policies on cost reimbursement basis where citizens share part of the burden.

The water policy of Ethiopia has provided guidance that tariff (user charge) structures in the water supply system should be based on equitable and practical guideline and

criteria, which they should be location based and determined accordingly to local circumstances. The policy states that rural tariff settings should be based on the objectives of recovering operation and maintenance costs, while urban tariff structures should be based on full cost recovery.

Full cost recovery demands users to pay all costs incurred in production of water and water tariffs to be calculated considering cost recovery. The principle of user must pay for portable water has to consider the willingness and capacity of communities that get the water service and at the same times the cost of the water scheme.

Despite all these, the cost recovery from users has not been considered much in the past (World Bank, 2004). Water tariffs did not have relation to the cost of producing water to consumers. Tariffs in urban areas are not sufficient to cover operation and maintenance costs, let alone the capital investment outlays. Hence, putting the cost recovery strategy in practice, after assessing the willingness and capacity of households, is wisely advised. As a strategy for cost recovery, price that reveals the ability and willingness to pay of the households for the improved water services can be introduced.

1.3. Objectives of the Study

The study is conducted to assess demand, willingness and capacity of individual households for improved water provision in Combolcha town, South Wollo.

Therefore, the specific objectives are to:

- assess Households' demand for improved water service
- quantify the Willingness to pay of households for improved water supply
- investigate determinants of Willingness to pay
- examine the applicability of cost recovery strategy based on the willingness to pay of households

1.4. Hypotheses

In view of evidences from empirical and theoretical literature we hypothesize that Age, Education, Sex, Income, Family Size, Dependency ratio and Time spent to fetch water variables will affect the willingness of households' to pay for the improved water service

1.5. Scope and Limitations of the Study

The study is limited in generating demand side information about improved water services from households in Combolcha town with no endeavor to check the financial management aspects. While conducting the survey, we faced time and finance constraints which obliged us to limit our study to the demand side only.

1.6. Significance of the Study

Water is vital for all human beings. And water demand of Combolcha town is rapidly increasing with its increasing population. To cope up with this problem, different mechanisms such as cost recovery strategy, have to be developed.

In relation to this, the study will help to assess whether cost recovery strategy can be implemented in the town as one means of alleviating the prevalent water shortage problem by inquiring how much the consumer is willing to pay for the improved water supply. Basically, this study can be an input for water sector development and/or supply strategies of Ethiopia in general and Combolcha town in particular.

1.7. Organization of the Paper

The remaining part of the study constitutes of five chapters structured as follows: chapter two deals with literature review. The third chapter discloses the methodology of the study. The fourth chapter deals with description of the study area and existing water situations of the town. The fifth chapter discloses the empirical results and discussions of the survey. And the last chapter deals with the conclusion and policy implications of the study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

Water is a common asset and is vital for sustainable life. All households need water for domestic use, i.e. for drinking, food preparation, washing, cleaning, etc. Access to adequate, clean water is a great input to better health and enhanced productivity (Dessalegn, 1999). Water security can be defined as access by all individuals at all times to sufficient safe water for healthy and productive life (Webb et al., 1998). In order to secure a household for water, maintaining the adequacy and reliability of supply and flow of water must be the major objective.

The idea of water security allows for water to be considered as a natural resource, a commodity and as an entitlement (Nokubonga, 2006). Water access refers to household control of water as a commodity. This is partly determined by manner of water distribution and partly by effective demand management which depends on socio economic and demographic factors of the household (Guha, 2007).

Household water inaccessibility can be caused on the income side of suppliers by an economic shock that sharply alters prices, thereby making poor urban dwellers reduce their water consumption rather than pay more. Again, it may result from the usage side as a result of sickness or death of the adult women in a household, sharply increasing the opportunity costs of fetching and carrying water for the remaining adult male (Hutton, 2006).

Water Aid (2007) declared that some 1.1 billion people in developing countries have inadequate access to water. WHO (2004) also added that 1.8 million people died every year attributed to poor quality water and sanitation.

Various regional studies have been undertaken to determine the impact of improved water supply on health, and with no doubt improved (safe) water access has a positive

influence on people's health. Water-washed diseases (Kadiatou, 2006) are prevalent in areas with inadequate water supplies for people to keep their hands, bodies and environments clean. Diarrhea diseases, as well as skin and eye infections, are easily spread under these conditions. Water-borne disease transmission occurs through the consumption of contaminated water, and can affect those illnesses transmitted by the faecal-oral route, including diarrheas (Mo Amin and Farahan, 2004).

Historically water was available in ample supply and was treated as a free good, and has remained so even with increase in population and economic growth. Unfortunately with this growth many rivers and ground water sources have become polluted and water is now a scarce resource (Gregory, 2002).

Facts like these generate their own consequences – and raise urgent issues of water management. The scarcity of water, like any resource scarcity, imposes the inevitable questions: Who gets how much? At what cost? At what price? But there are deeper questions that also need to be addressed: Who decides? By what procedures ? What features of governance will most likely produce management decisions that are fair, effective, and environmentally sustainable?

2.2 Theoretical Framework

It is now conventional wisdom (and true as well) that water scarcities typically reach beyond community boundaries and political borders; they are generally the shared problems of countries and continents. Indeed, for many countries, the water body is the border. About 40 percent of the world's population lives now in river basins shared by more than one country. Scores of communities (think of Israel and Palestine) rely for drinking water on the same over-stressed aquifers. This is why water scarcity, ill-governed, so frequently raises the risk of conflict. It is also why, importantly, people find ways to manage shared water much more often by cooperation than by warfare. In short, sound water management both requires and impels national, regional, and international action.

But national and supranational strategies alone are not enough. Experience around the world proves that local management is essential to the sustainable exploitation of scarce water supplies. Community-based natural resource management – and specifically water management – must play a critical part with those larger approaches in solving scarcity problems. Local water management permits a democratizing decentralization of decision and accountability. It empowers people (particularly the poor and otherwise disadvantaged) to take part in the decisions that define their own futures. And it encourages the integration of traditional knowledge with innovative science to promote fair and efficient supply management. In these ways, water degradation and shortage can be transformed into sustainable sufficiency.

2.3. Valuing Water

Water has been traditionally provided to meet demand, but it is becoming very expensive to route to large scale infrastructure solutions for providing water to meet the ever increasing demand.

Water valuation is an economic tool that can contribute significantly to managing water demand, and may bridge the gap between supply and demand. The concept of "*value* of water" is more complex than financial and/or economic valuation as it includes several other dimensions, such as the social, cultural, historical and environmental (Abid Lahlou, 2007).

According to Hansson (2004) water can be seen from two dimensions: water as economical good and as social good. These views are different from the point of view of what water really worth, given that it means different thing to people from different societal and cultural backgrounds and in different climatic set up.

2.3.1. Water as Economic Good

Considering water as an economic good relates to making the right choices about the utilization of water in the broadest socio economic framework. This is something

completely different from water pricing as the later has to do with cost recovery and demand management (Borgoyary, 2002). The only relationship with economics is that the price charge should not be higher than the economic value. Water as an economic good has everything to do with setting priorities in view of the public interest where as economics is about the right choice not about setting the appropriate price of water.

Perceiving water as economic good symbolizes that water should be produced and consumed in an efficient way. In other words arguing for water to be treated as an economic good does not necessarily imply that a market price must be paid for it. Rather, it means that water is scarce and valuable resource that should not be wasted and proper valuation (pricing) will ensure efficient utilization (Jack Moss et al., 2003). In economics efficient consumption of any good, including water, means that the value of the good for the person consuming it must exceed or at least be equal to the total cost of resources consumed in producing the item. Otherwise it is possible to use the resources - used to produce that good- in another and more productive way (Hansson, 2004).

2.3.2. Role and Objectives of Water Pricing

There is a growing global need for more water. Pricing is not just about reducing consumption, it is to a large extent about giving encouragements to save water. Economists put two levels of values: market value and non-market value. In many water decisions, non markets value often play a much bigger role than people really recognized (Guha, 2007). The difference between market values and non market values is extremely important for practical reasons. Market values are revealed in exchange of goods and service and can influence people's values to some extent in their market behavior. Willingness to pay a large amount for something indicates that the item is valuable (Pattanayak et al., 2006b).

Market values should not be confused with price. Price represents the marginal value or exchange in a particular market – the value at which the last or next exchange occurs. Where as, the market value refers to the total value of goods and services exchanged in each market (Katual and Bohera, 2007).

Non market values are like the entire ice burg, which market values are part of it that is visible above the water (Bhandari and Grant, 2007). Non market values are a category with in what economists refer to as preferences (or tastes). But unlike common preference or taste, non market values of water can be of deep preference due to its intrinsic and cultural nature.

Financial and Revenue-generation Aspects

Water pricing is often conceived as an instrument of cost recovery in water utilities. Weak cost recovery translates into inadequate financial resources to maintain minimum Operation and Maintenance (O&M), not capable of expanding or upgrading the system to accommodate additional users. Different case studies provide illustrations of this situation for drinking and wastewater services. In Jordan, drinking water prices were far below real costs of O&M and, as a result, the distribution networks were not properly maintained (Taha and Bataineh, 2002 cited on Abid Lahlou, 2007). Thus, water was being lost through increasing leakages in a country where it is particularly scarce and households suffer severely from shortages.

In the absence of additional financial resources (from the government budget or from external loans), water utilities would need to substantially increase water tariffs in order to generate the needed revenues to prevent further deterioration in the provision of water services. Additional increases in water tariffs would also be needed to adjust for periodic increases in O&M costs and for inflation in general (Alaba, 2001). Another important concept to be considered in water pricing is "*willingness to pay*". It is often argued that users may be willing to support a price increase if they can expect a parallel tangible improvement in services (Bosch et al., 2000).

Borgoyary (2002) made analysis that suggest a useful frame work of economic rationale for implementing water pricing (water valuation) reforms as follows:

i. *Relative value of water*: like other goods, water also has a value that any consumer will be willing to pay as long as the marginal benefit of consumption exceeds the cost. Water must not be assumed to have zero values.

ii. *Cost of Water*: while the value of water depends on its use, the cost of water is usually associated with the storing and delivering facilities or outlays; the user cost

iii. *Balancing Water Values and Cost*: users pay only a part of the full economic cost of water. And cost recovery in most developing nations is too low. In short, treating water as an economic good or ensuring proper valuation of it will provide powerful decisions and management tools – ensure suitable water resource management.

The total economic value of water can be considered to be the maximum amount the user would be willing to pay for the use of water.

Economic Aspects and Efficient Allocation of Resources

Pricing of goods serve the following two purposes:

- To allocate resources in an efficient and fair way
- To allocate scarce resources to those sectors which they create the highest value

Water pricing is an important tool for resource allocation because it provides guidance, both to users and to planners, in comparing alternative solutions.

2.4. Social Aspects of Water

When there is no funding to expand water and sanitation systems, the first to suffer are the poor who live on the outskirts of the cities and in the countryside (Gulyani et al., 2005). Because these communities are often unconnected to the water system, they find themselves obliged to pay high unit prices for trucked water, and to cope the lower and insufficient quantities of uncertain quality, or to see their women and children spend their time carrying water, instead of going to school or engaging in more profitable activities.

According to some, social concerns should focus on facilitating connections for these disadvantaged groups to the drinking water and sanitation systems, i.e. giving them access to services, rather than keeping prices artificially low for all consumers (Saghir, 2002). In Morocco, families not connected to the water network pay 7% of their household budget on water, while those that are connected pay only 0.7% (Lahlou and Bahaj, 2002).

It is often argued that the price of water for consumers should be based on the concept of "*ability to pay*". For drinking water, this ability is often measured by the ratio of the costs of such services relative to the overall household budget (where the ratio should generally not exceed 5%).

2.5. Environmental Aspects of Water

Mostly relevant to wastewater services, tariffs generate investments for collection and treatment before discharging it into the environment or reusing it. Thus, tariffs also have an environmental role, often expressed in the "polluter pays" principle. The polluter pays principle means that the person who uses water, and thereby pollutes it, must pay the cost of releasing it, purified, into the environment (Jack Moss et al., 2003).

2.6. Factors that Influence Household's Willingness to Pay for Improved Water Supply

The three set of characteristics jointly influence a household's willingness to pay for improved water supply pointed by World Bank Water Demand Research Team (1993) are:

- Socio economic and demographic characteristics of the household: education, occupation, family size and composition, income, expenditure and assets

- The nature of the existing water system versus the improved supply system proposed: cost (both financial and time required to collect water), water quality and reliability of supply

- Households' attitude towards government water policies and their sense of entitlement to government services.

2.7. Empirical Review: Evidences from WTP Studies in Developing Countries

Several studies have been carried out in developing countries to assess factors that determine households' willingness to pay for improved water service in different scenarios and areas. Many scholars claim that water supply projects will be sustainable when consumers are willing to pay users charges that are sufficient to cover all operating and maintenance costs.

Willingness to pay can be construed as an indication of the demand for improved service and their potential sustainability (Kaliba, 2002). But according to World Bank Water Demand Research Team (1993), sustainable water future depends on appropriate prices and the necessary resources need to come from the project consumers.

The concern of the economic management of water as a commodity has led to increased attention to water pricing and to market (Hansson, 2004). This trend has been step up by pressures escalating on governments to take out age-old subsidies, impose fees for water provision, or even to dissociate themselves from of responsibilities for water supply and allocation together.

Governments have historically subsidizes much of the cost of water (Rosegrant 1997, Bhatia and Falkenmark 1993, Repetto, 1986 cited on Babalobi, 2004).Subsidies have rarely benefited the poorest households simply because they tend to live away from piped service. Thus, removal of a subsidy may have limited impact on the water insecurity of the poor. In fact the poor often pay more for water than wealthier households do (Debomy et al., 2005). Numerous studies documented that large numbers of urban poor pay higher prices and much a larger share of their income for water than families with high income and access to city water system (Bhatia and Falkenmark 1993, cited on Guha, 2007).

Water from vendors is costly and might require large portion of the household's income. In most cases respondents purchasing water from vendors or other sources for much higher prices per liter than it would be if they were connected to the piped water system. For example households in Jakarta, Indonesia have been estimated to spend up to $50 million per year to boil water for drinking- which approximates one percent of the city's GDP (Kremer et al., 2007). Study at Anambra region of Nigeria, (Whittingon et al., 1991) concludes that households already paying a lot for water had a high WTP for water. Poor households in Anambra region were estimated to pay 18 percent of their income on water, where as wealthier households paid about 2 – 3 percent of their income on water.

McPhail (1994) specifically asked respondents in Tunis, Tunisia about the reason(s) why they had not yet connected to the piped water system. The reasons most frequently reported by people were that (i) they could not afford it; (ii) they were renters and the owners would not pay to have taps installed; (iii) they believed their

title to the land was affected by some irregularity, and hence the water authority would not provide the individual connection to the system. Finally, some respondents (about nine percent) stated that they lived very close to a public standpipe and did not need an individual connection.

Reddy and Vandemoortele (1996 cited on Farrington, 2003) said that per capita demand for fresh water is a function of the growth in per capita income and income elasticity of water demand. But one should also keep in mind that willing ness to pay may differ from the ability to pay. It can not always be assumed that individuals who are willing to pay for a basic service will be able to do so. For example, some researches have shown that women have higher willingness to pay for improved water supply than men (Green and Badan, 1995 cited on Webb et al., 1998). But lack of control over household's income, patriarchal decision making structure and/ or partiality in intra household resource allocation processes may hold them back from committing resources to such ventures (Saghir, 2002) .

But note that, hypothesis about women, who bear the burden of obtaining water in the absence of piped water system, to hold greater WTP figures come true in some (Whittington et al., 1990, Alaba, 2001, Kaliba, 2002), but not at all of the studies (Altaf et al., 1992, Nam and Sons, 2004, Fujita et al., 2005). Perhaps this is because women in many developing countries have little control of household finance and may refrain from expressing their own opinion (Singh et al., 1993 cited in Guha, 2007).

Economic theory suggests that willingness for a good should increase as the cost of purchasing substitutes for that good raise. When the good to be valued is a connection to the public water system, one would expect that households facing monetary and time costs for alternative water source would hold high values for pipe waters. In practice, this has confirmed true in some studies and has been proved false in others. For example, Kaliba (2002) reported that households located far from water points show higher willingness to pay than their counter parts living with in

proximate. Similarly, Gulyani et al. (2005) said that the poor households in Kenya spend an average of 42 minutes in collecting water and time spent to fetch water variable has a statistically significant influence. Pattanayak et al. (2006a) in Sri Lanka found that poverty and costs as key determinants of demand. In the same token studies in Ethiopia (Fisseha, 1997, Assefa, 1998, Dunfa, 1998 and Alebel, 2004) found that time taken to fetch water seriously affected the willingness to pay of households for the improved water service.

Researches indicate that installation of village based stand pipe or pump can relief women–who are responsible to fetch water-and increase water consumption four fold simply because it reduces the time required to obtain water (Cairncross, 1987 cited in Pattanayak et al., 2001).

There is evidence from Mozambique, India, Ghana and Ethiopia (Coppock 1994, Saywell 1998 cited in Debomy et al., 2005) that poor rural as well as urban residents would be willing to pay more for safe water delivered reliably near to their home. And several studies on demand for water in rural areas, suggest that socioeconomic factors such as education levels and the gender of the respondent have a large role to play in determining the demand for water and the source choice (World Bank Water Demand Research Team 1993).

It has been suggested that households' usually pay or willing to pay 3 to 5% of their income for an improved water supply (World Bank Water Demand Research Team 1993). Studies also indicate that (Altaf et al., 1993) households were willing to pay 40% more per month for the new reliable service.
Different researches have also involved the use of Contingent Valuation Method to examine whether willingness to pay for drinking water across households may be explained by the households age, income, wealth, Family size, satisfaction with the existing water source and household's expenditure to purchase water.

Accordingly, although Kaliba (2002) from Dodoma regions of Tanzania found income to have negative impact, facts from Nigeria (Alaba, 2001), the republic of Peru (Fujita et al., 2005) and Ethiopia (Fisseha, 1997, Assefa, 1998, Dunfa, 1998, Genanaw, 1999, Gossaye, 2007), disclosed that it is a strong determinant and positively affect the households' choice of house connection in both the rural and urban areas.

And also some studies confirmed that, willingness to pay for improved water service increases with wealth of the household (Altaf et al., 1992, Bohm et al., 1993, Alaba, 2001, Alebel, 2004, Kinfe, 2007) and decreases with family size (Bohm et al., 1993, Nam and Sons, 2004,) and number of children in the household (Nam and Sons, 2004).

Kaliba (2002) in Tanzania, Fujita et al., (2005) in Iquitos city, the republic of Peru Medhin (2007) in Ethiopia found that age of the respondent and current water usage practice determine the willingness to pay for the improved water supply service. And also Education level of the household, Whittington et al. (1990), Altaf et al. (1992).

But, in contrary Gulyani et al. (2005) said that in urban areas Kenya, economic factors such as price and quantity, rather than socio-economic variables such as education level and gender, help explained much of the variation in households' decision on whether to connect and which option to choose.

To summarize, most studies of WTP for improved water supply found varying level of WTP, depending on the cost of obtaining water from alternative sources, income, wealth, gender, age and education level, the quality and reliability of existing water source, and monthly expenditure for water variables.

CHAPTER THREE

3. METHODOLOGY

3.1. Overview of Contingent Valuation Method

The contingent valuation method (CVM) is one of the most commonly used valuation methods employed to calculate the monetary values of non marketable environmental goods (Bateman and Turner, 2005). CVM has principally been applied in highly industrialized economies to measure the value of environmental services; however in recent years the method has also been applied in developing countries to measure the demand for goods and services such as safe drinking water and health care.

This valuation method is a questionnaire based valuation technique whereby willingness to pay (WTP) or willingness to accept (WTA) is directly obtained from the respondents with respect to a specific good. In this context a hypothetical market for a non-marketed good is defined and respondents are requested to specify how much they would be willing to pay for provision of specific environmental services or how much they would be willing to accept for giving up certain environmental good or service (Jacques, 2005).

It is called "contingent" valuation, because people are asked to state their willingness to pay, *contingent* on a specific hypothetical scenario and description of the environmental service.

3.2. Data Type, Sources and Sample Frame

3.2.1. Data Type and Source

In this study primary and cross sectional data for the year 2007/8 collected through Contingent Valuation Survey from Combolcha town is used.

Selected Households in the town are contacted by interviewers with structured questionnaire. The questionnaire consisting of different sections that inquire information as to the socio-economic characteristics of the household, the existing water supply situations, CV questions on willingness to pay and attitude towards responsibility to provide water for the town. As open-ended responses have some drawbacks: Average WTP may be affected (dominated) by few extreme WTP amounts and samples may typically affected by rounding errors, our questionnaire is designed based on a single bounded dichotomous choice method of eliciting WTP followed by an open ended question[1].

In designing and conducting the questionnaire we made an attempt to minimize biases; such as strategic, hypothetical and others which may arise from contingent valuation survey. Besides, in order to determine the starting price for the biding game, to enable the enumerators to have practice in administering CV survey and to check the wordings and ordering of the draft questionnaire, we conducted a pretest survey before we started the main survey.

Along with the questionnaire based survey, we made discussion with key informants in the town, such as the Town Water Supply Office Administration staffs. Moreover, as secondary source relevant documents from the Ministry of Water Resources, Combolcha town water supply office and other relevant entities are also used.

3.2.2. Sample Design and Administration

The town consists of five Kebeles, and all were included in the survey. To assure the sound representativeness of the sample, a three stage stratified sampling method is used. In stage one, the town was divided in to three income clusters[2]: areas where

[1] The open ended question is added in order to obtain the maximum cent that households with' no' answer for initial bid in the dichotomous question are willing to pay.

[2] The income category is formulated on the prevalent socio economic circumstance of the town. To do so, we conduct a survey across different households in the town and for this study we come up with the result that households earning a net birr 1,300 and above per month are categorized in high income class, and those earning less than birr 500 per month are considered as low income class. The rest who fall in between the two classes are judged to be medium class.

high-income households live, middle-income households live and low-income households live.

In stage two, after we obtain the number of households in the town from the town's information bureau publications, we calculate number of households we need to survey from each income category based on each category's population. To determine the number of households per income class, we calculate the ratio of each income group population to the total population in the town and multiplied by the total number of surveys we needed for the study area. It can be equated as follows

$$S = (C/N) * n$$

Where: N = Total population of the town

n = Total number of household in the sample

C = Total number of households in the income class

S = number of households to be surveyed from each income category

In stage three, the specified number of households from the three income classes: High, Middle, and Low; are randomly selected from a pre-listing of households in every kebele. The random selection of these households allows us to generalize our findings. For this study our sample constitutes a total of 247 households.

As an input to keep the quality of our data, we calculated the error in sampling so as to ensure whether the sample taken is representative:

$$e = \sqrt{1-(n/N)}\ \sqrt{p(1-p)/n}$$

Where;

e = standard sample error

n = sample size (247)

N = total population (19,439 household)

P = success for each income group to be included in the sample (p = 0.33)

1-p = failure for each income group to be included in the sample (1-p= 0.67)

$= \sqrt{}\ 1\text{-}(247/19{,}439)\ \sqrt{}0.33\ (1 - 0.33)/247$

$= \sqrt{}1\text{-}0.0127\ \sqrt{}0.2211/247$

$= 0.9936 * 0.02992$

$= 0.02973$

$= 2.97\% \approx 3\ \%$

The standard sample error is statistically acceptable. This implies that the sample taken is fairly representative.

Accordingly, out of a total of 247 sample households surveyed, 109 (44.1% of the sample size) are from low-income categories, 75 (30.4%) of the sample households are from the middle income and the rest 63 sampled households (25.5%) are from high-income categories. The selected households are constituted in the survey sample and contacted by our enumerators by using their names and addresses (house numbers).

For situations where it is impossible to interview the selected household after repeated attempts, we arrange a geographical replacement mechanism. In addition to this rule, each enumerator is supplied with a guideline document providing further suggestions for using judgment to maintain the random sampling process and the survey has been seriously monitored.

3.2.3 Data Analysis

In this study the data are described through descriptive statistics, using simple frequency tables. To test the hypothesis a probit model is used and the regression run and results are analyzed using STATA 9 software.

3.3 Model Specification

Econometric Model for Single Bounded CV Questions

To capture Households' preferences between the existing and the projected new improved water supply system and to determine factors influencing their preferences,

in this study a discrete econometric model is used. This approach works with the utility function in that the utility derived from using new improved water services may be expressed as a function of several attributes such as characteristics of the existing water source and socioeconomic characteristics of the Household. Thus what is needed is a model that describes the probability that a particular household will choose to use a new improved water source. In this approach, first it is assumed that a household chooses between two sources based on maximizing two conditional indirect utility functions: the utility gained from using the new improved source, and the utility derived from use of the existing water source.

The probability that a Household will decide to use the new improved rather than the existing source symbolizes the probability that the conditional indirect utility function for the new improved sources is greater than the conditional indirect utility function for the existing source. Therefore, let U^n represents the utility a household gains from the new improved source, and U^0 represents the utility a household gains from the existing source, the observed choice between the two alternatives reveal which one provides the greater utility, but not the unobservable utility. The observed indicator equals one if $U^n > U^o$ and zero if $U^n \leq U^o$.

The household will connect to the new improved water supply service or not. The choice is influenced by both the household and water source characteristic.

The ordinary formulation for this model is

$U^n = \beta_n X + \omega_n$

$U^o = \beta_o X + \omega_o$

Where X = vectors of explanatory variables which include socioeconomic and demographic characteristics of the household and water attributes

β's = parameters of the model

ω's = the error terms

Now we denote Y = 1 when the individual selects the new system, then the probability that a household chooses the improved water service is:

$P(Y = 1|X) = \text{prob}(U^n > U^o)$

$$=\text{Prob}(\beta_n X + \omega_n - \beta_o' X - \omega_o > 0|X)$$

$$=\text{Prob}[[\beta_n' - \beta_o']X + [\omega_n - \omega_o] > 0|X]$$

$$=\text{Prob}(\beta' X + \omega > 0|X)$$

$$=\text{Prob}(\omega > -\beta' X|X)$$

If the distribution is symmetric,

$P(Y=1|X) = \text{prob}(\omega < \beta' X)$.....3

$$= F(\beta' X)$$

Where F is cumulative distribution function (CDF). This provides an underlying structural model for the probability. This model is to be estimated either using probit or logit model, depending on the assumption on the distribution of the error term (ω). Assuming ω is normally distributed with mean zero and variance one; our model takes a form of probit model. In this qualitative model, respondents' response is equal to the indirect utility that the household receives from choosing to connect to the new improved service rather than continuing to use the existing service (Green, 1993).

Therefore, in this study, assuming the probability of a household to make a particular choice is a linear function of his attributes; the following probit model will be used to estimate the household's probability of choosing the new improved water system.

$$P(Y = 1|X) = \beta' X + \omega \text{.....(4)}$$

The dependent variable is the probability of a household to choose the new improved water service. It is a dummy variable, and takes a value of one if a household prefers the new improved water service, and it takes zero if the case otherwise. X is vector of

explanatory, β' is regression coefficients and ω is an error term to capture unobserved variable.

3.4. Definitions of Explanatory Variables

1. Religion of the Head of the Household (Relg): Dummy variable: 1 if Muslim; 0 otherwise. We include this variable to check whether willingness to pay for improved water service take religion as a factor. The effect is to be checked from the result.

2. Sex of the Head of the Household (Sex): Dummy variable: 1 if Male; 0 otherwise. Studies on household water use assume that women would attach more importance to improved supplies than men, and thus women would be willing to pay more for such services.

3. Age of Head of the Household (Age): Continuous variable in number of year. This variable will be expected to be negative since older people are traditionally used free water services so that they may be less willing to pay and may have low preference for a new source that will require fees.

4. Average Monthly Income of the Household (Inc): Total monthly income all active members of the household. It is a continuous variable measured in Birr. Based on empirical results done in similar areas and economic theory, quantity demanded and income are positively related in case of normal goods. We expect Positive effect.

5. Household Size (HHs): number of people living in the household. As the number of family size increases, the need for water will be higher. But the household will have excess labor to fetch water and, hence, WTP will be low. But if the family is small it prefers to have private connection to the improved water service. We expect negative effect.

6. Dependency Ratio of the Household (Dpr): the ratio of the number of non productive members of the household to those of productive in the household. As

the dependency ratio increases; the active members of the household would assume more financial burden and WTP for water will be low. We expect negative effect.

7. Wealth[3] (House): It is proxied by ownership of house. It is a dummy variable: 1 if the household owns house; 0 otherwise Wealthy households are more willing to pay and prefer to have private connection to the improved water service, and thus we expect Positive sign.

8. Education Level of the Head of the Household (Educ): Dummy variable: 1 if the respondent join secondary or college education; 0 otherwise. Its effect is expected to be Positive since educated households are more aware of the multi benefits of improved water service. Thus they are willing to pay more and have more preference to improved water service.

9. Occupation of the Head of the Household (Occup): It is dummy variable 1 if the respondent is employed (work for salary), 0 otherwise. Studies support that those respondents employed in governmental and non governmental organizations are willing to pay more than those of the self employed and/or the unemployed ones.

10. Source of Water the Household is Using (Wats): it is dummy variable, and takes 1 if the household uses pipe water; 0 otherwise. We expect negative effect since those respondents using non pipe water are more willing to pay as they need to obtain diverse benefits that they did lack.

11. Time taken to fetch water from the existing water service in minute (Time). In areas where there is inadequate amount of water compared to its demand, people may spend much time to fetch water. One benefit of providing improved and adequate water service is time saving, which has an opportunity cost of using the time for other productive activities.

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[3] Before we proxied wealth by house ownership we try to see realities in the town and made a survey to request different native people to tell us their criteria of judging a person as wealthy. Many of them respond that a person to be regarded as wealthy should have to have at least a house.

12. Year of stay in the town (Durn): continues variable in years, denoting number of years the head of the household stayed in the town. This variable is expected to have negative effect, as people that stayed long in the town will have no inclination to shift from their traditional use and may be less willing to pay and may have low preference for a new source that will require fees.

13. Level of Satisfaction with the existing water supply service (Sat): Dummy variable 1 if the household is satisfied with the existing water supply; 0 otherwise. Our expectation is that a household would be more willing to pay for an improved source when he/she is not satisfied by the existing water source.

14. Monthly Expenditure for Water Consumption (Expdr): Continuous variable in Cents. Some households in the town are buying water from vendors, whose price is higher than the official tariff. In some events though the volume of water consumed is the same, expenditure for water consumption may vary among households. Hence, more cost in terms of money for the existing service may lead the respondent to state more value for the improved water service.

15. Quality of the existing Water the household is using (Qual): Dummy variable 1 if the household rated the water very good; 0 otherwise. Households that satisfied with the quality of water they are using would be less willing to pay for an improved source.

16. Starting Price for the Bid Game (Bid): respondents provided with low bid price will be more willing to pay than the case otherwise.

17. Attitude of the Respondent towards the Responsibility of Town Water Provision (Attitu). It is a dummy variable, and takes 1 if the respondent says the government; 0 otherwise. We expect negative effect. If the respondent says the government should provide water, he/she may expect that the government to provide the service at low price and thus less willing to pay.

CHAPTER FOUR

4. BACKGROUND OF THE STUDY AREA

4.1. Description of the Study Area

Combolcha town is located in Amhara Regional State at 39^0 44' N latitude and 11^0 07' E longitude 375 kms away north of Addis Ababa on the road to Mekelle. It is neighboured to the North and West with Dessie Vicinity Wereda; and to the South and East with Kalu Wereda. The town is built on a plain table land at an average elevation of 1,900 meters above sea level surrounded to the North, East and West by tall mountains where mount *Yegof* is the highest. The narrow and deep valley plain has given a town a hot and Semi humid weather.

The town has a bimodal rainfall pattern, which shows two rainy seasons known as *Belg* (Short rain with annual average rainfall of 264.2mm) and *Kiremt* (Long rain with average rainfall of 435.1 mm) seasons. The annual average rainfall of the town is 1,038.1 mm where 1,360.8 mm (in 1998) and 598.5 mm (in 1984) are the maximum and minimum extremes registered. It recorded an average 26.5°c temperature that increases every year, where the maximum temperature is 34.1°c in 2002 and the minimum is 12.3°c with a variation between 10 to 15°c.

In addition to the 12 kms Addis - Mekelle asphalt highway stretched between the town ends, Combolcha has 1.8 kms asphalt road constructed by industries in the town and also 30 kms of gravel road. The town is featured by four rivers named: Borkena (main river which cuts through the town in the middle from north to south) Berbere, Arawule and Worka. There are One University, Two Colleges, Two high Schools, Fifteen Elementary Schools and 12 Kindergartens in the town.

According to Combolcha trade and investment guide (2007) the town is structured in to five kebeles with estimated total population as of June 2007 of 81,642 of which

42,664 (52.26%) males and 38,978 (47.74%) females, resided by a majority of Amhara ethnic group and small number of Oromo, Argoba and Tigre. There are about 19,439 households (Combolcha town trade and investment guide, 2007) with 4.2 average persons per the household.

Being industry and commerce are the dominant activities; the town is a host of more than 10 large and many medium and small scale industries. Among all Combolcha Textile S.Co., BGI Ethiopia, Combolcha Flour Factory, ELFORA, Combolcha Tannery, KOSPI and Tikur Abay Transport S.Co. are some to mention.

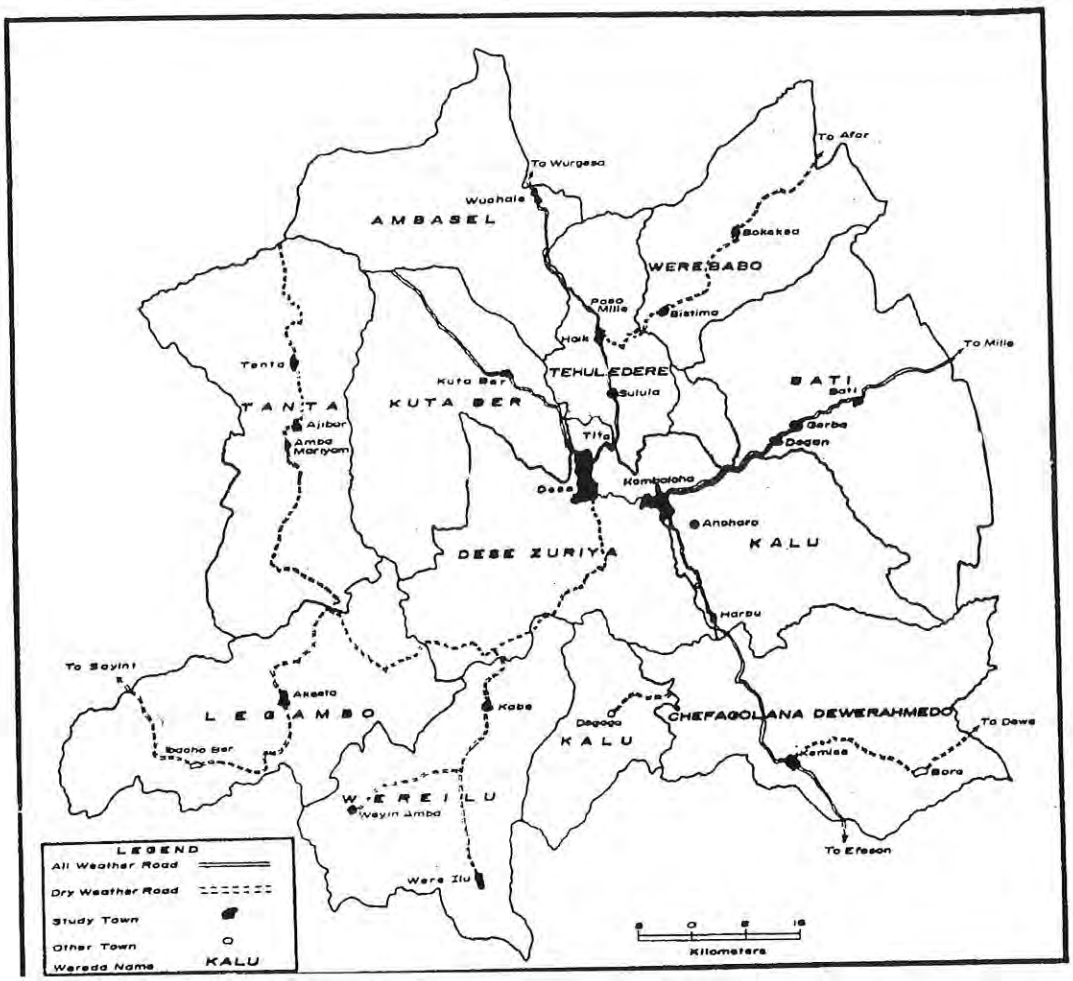

Figure 4.1. Map of South Wollo, adopted from Gaile G.L. 1999

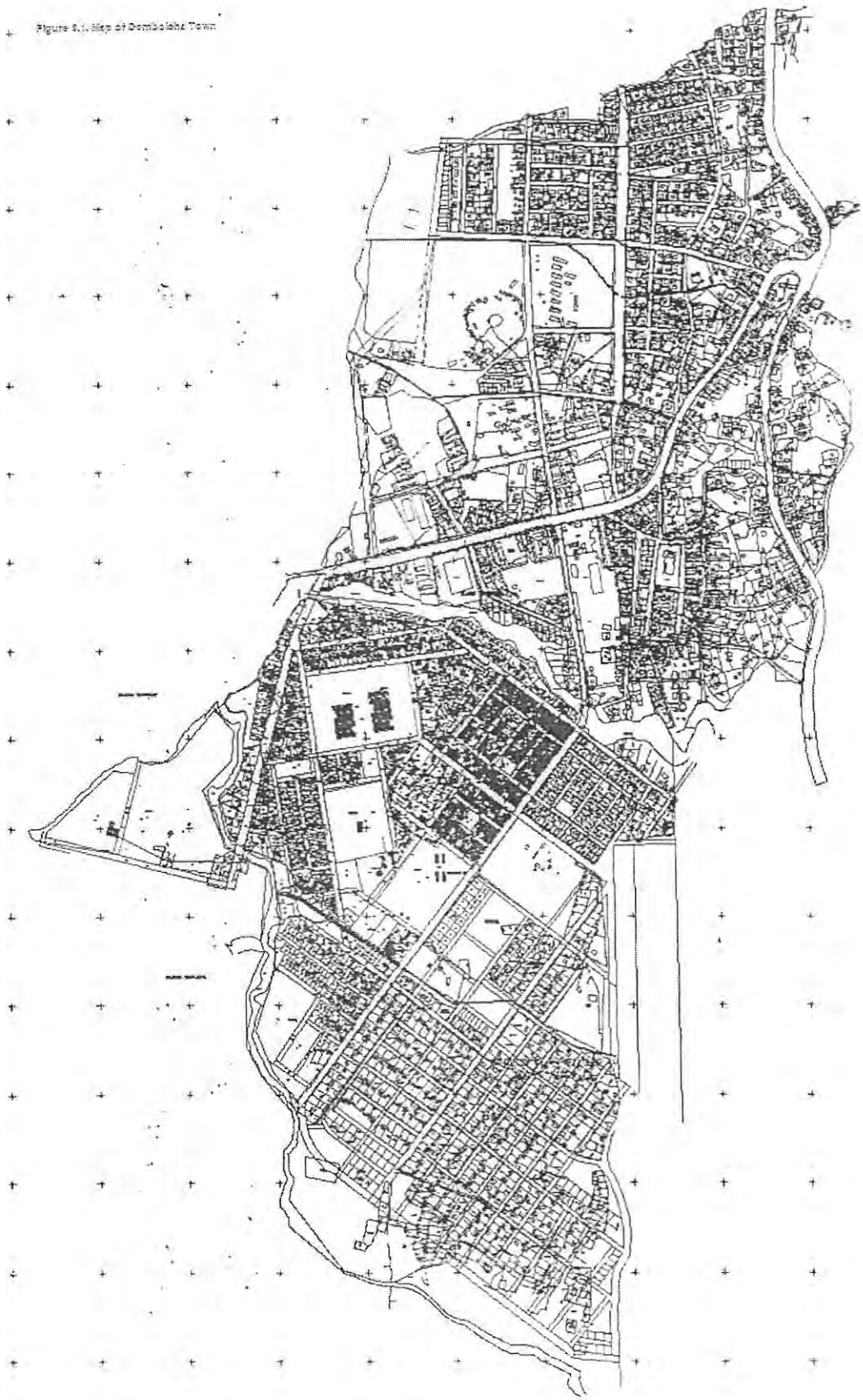

Figure 4.2. Map of Combolcha Town

4.2. Existing Water Supply Situation of the Town

According to the information obtained from the town's water supply office, Combolcha gets water from six boreholes located at three different areas: *Mariam Church, Dewey Meda, and Sheshabir.* The water yield of each bore holes ranges from 10 to 50 liters per second. Leakages are about 21% of the total water production. The water is distributed to consumers through 5,124 connections and 48 public taps. Table 4.1 shows the type and number of connections in the town for 2007/8.

Table 4.1: Type and Number of Connection

Type of Connection	No. of Connection	% of Connection	Average Consumption /m3/month	% of total Consumption
Domestic	4,693	90.7%	32,550	63.5%
Commercial Enterprise	294	5.7%	8,890	17.3%
Governmental Enterprise	105	2.0%	7,397	14.4%
Factory	6	0.1%	25	0.1%
Non Governmental Org.	26	0.5%	957	1.9%
Public Tap (Rented to individuals)	35	0.7%	881	1.7%
Public Tap	13	0.3%	574	1.1%
Total	5,172	100.0%	51241	100.0%

Source: Combolcha town water supply office, 2007/8

As it can be inferred from the above table only 4,693 (24.14%) of the total 19,439 households in the town have their own private connections. This implies that majority of the town households have no access to private tap.

4.2.1. Water Tariff Structure of the Town

The water tariff in use by the town's water supply office is given below for different bands. Water is sold at the public tap at a rate of Birr 1.25/m^3. On the other hand, water vendor rates are between Birr 10 - 12.5/m^3.

Table 4.2: Existing Tariff Structure of Combolcha Town Water supply Office

Band	Tariff (birr/m^3)
1 - 5 m^3	2.10
6 - 10 m^3	2.30
11 - 25 m^3	2.60
25 - 40 m^3	3.00
> 40 m^3	3.50

Source: Combolcha Town Water Supply Office, 2007/8

Water production of the town's water supply office, table 4.3 below, is increasing from year to year, illustrating an ever increasing demand for water in the town.

Table 4.3: Water productions per year

Year	Total production of water (m^3)
1998/99	441,000
1999/00	400,514
2000/01	494,000
2001/02	493000
2002/03	536058
2003/04	546962
2004/05	563865
2005/06	542672
2006/07	910013
2007/08	399,457**

** Only for six months

Source: Combolcha town water supply office, 2007/8

Table 4.4 shows the cost and revenue of the town water supply office for the years 1998/9 to 2007/08. As can be seen from the table, the financial capacity of the town's water supply office is relatively better: the operation and maintenance (O & M) cost was less than the revenue.

Table 4.4: Cost and Revenue of Combolcha Town Water Supply Office

Year	Revenue (birr)	Cost (birr)
1998/99	737,186.02	523,270.45
1999/00	674,091.20	430,347.95
2000/01	1,050,925.03	618,569.47
2001/02	1,188,092.50	883,531.00
2002/03	1,223,920.04	686,304.54
2003/04	1,203,450.05	740,173.75
2004/05	1,276,125.64	884,745.95
2005/06	2,601,411.75	1,657,671.37
2006/07	2,490,294.13	2,210,174.94
2007/08	1,276,574.82**	787,214.89**

** Only for six months

Source: Combolcha Town Water Supply Office, 2007/8

CHAPTER FIVE

5. EMPIRICAL RESULTS AND DISCUSSIONS

5.1. Socio – Economic and Demographic Characteristics of the Households

Households Characteristics

A total of 247 sample households were interviewed in the survey. Out of this only 220 are analyzed and the remaining 27 are removed due to pro test zero case[4]. Of the total 220 households 59 (26.8%) are from high income, 67 (30.5%) from medium and the rest 94 (42.7%) are from low income group. Data about the religion of the respondents indicate that 136 (61.8%) are Muslims and 84 (38.2) are Christians or non Muslims. Being expenditures and willingness to pay needs the consent of the head of the household, all sample respondents in this study are head of the household, of which 162 (73.6%) are male and the rest 58 (26.4%) are female. The average family size of the total sample household is 4.1 with the minimum 1 and the maximum 8. Average year of stay in the town is 19.6 years with the minimum of 1 year and the maximum of 60 years.

Data about the age of the respondents' shows that the average year is 43.9; being 85 the maximum and 22 the minimum: derived from 44.4 for high, 42.4 for medium and 44.7 for low income groups.

Education level of the respondents ranges from minimum of not able to read and write to the maximum of college graduate. From the total respondents 49 (22.3%) neither read nor write, 27 (12.3%) only can read and write 45 (20.5%) have completed primary education, 59 (26.8%) have completed secondary school and the rest 40 (18.2%) have joined higher education. Data about the occupation of the respondent shows that 90 (40.9%) work in government organization, 7 (3.2%) work in non governmental organization, 110 (50%) are self employed and the rest 13

[4] Households already satisfied with the existing water provision service and not willing to pay any amount

(5.9%) are unemployed and/or are retired. The average monthly income of a household is Birr 846.6 ranging from the maximum of Birr 3,700 to the minimum of Birr 120 per month

Table 5.1 Summary of descriptive variables

Variable	Mean	Std. Dev.	Min	Max
RELG	0.6181818	0.4869403	0	1
DURTN	19.63182	12.2622	1	60
SEX	0.7363636	0.4416092	0	1
AGE	43.89545	11.58857	22	85
HHS	4.136364	1.49567	1	8
DPR	0.5039394	0.5898921	0	3
INC	846.5773	658.3642	120	3700
WATS	0.9136364	0.2815409	0	1
TIME	27.75	21.41259	10	120
DIST	59.48182	98.49917	5	800
SAT	0.6545455	0.4766007	0	1
SHORT	0.7045455	0.4572873	0	1
PURI	0.0409091	0.1985313	0	1
HEALTH	0.1181818	0.3235595	0	1
WILL TO CONNECT	0.9863636	0.1162404	0	1
WILL TO PAY	0.7727273	0.4200259	0	1
EXPNDR	7.092614	7.884386	0	45
CONSUMP	1532.727	643.4225	300	3750
BID	0.1859091	0.0679551	0	0.3

Source: Own Survey, 2008

Households' Housing Characteristics

Regarding wealth of the households, which is proxied by whether the household owns house or not showed that, of the total sample households 84 (38.2%) have their own house, 62 (28.2%) rented from private individuals, 36 (16.4%) rented from kebele or government and 38 (17.3%) are given by their host organization which they are working for.

Data among the three income categories revealed that 25.4% of the higher income, 22.4% of the medium and 57.5% of the low income households are living in their own house; 23.7%, 29.9%, 29.8% of the higher, medium and lower class respectively rented their home from individuals; 3.4% of the higher, 32.8% of the medium and 12.8% of the low income households rented their house from kebele or government and 47.5% of the high and 14.9 of the medium income respondents are furnished by their employer organization.

Perception of Households' for Different Social Services

The total sample households were given different social services to rank in accordance with their priority of need. Survey results showed that 86.5% reported that health service is their first need, 57% said water supply is their second need and 28 % of the respondent rank electricity service as their third need. Education, road and security service are ranked from fourth to sixth respectively. This shows that health and related services such as water supply are very essential for the town people among the different social services given as options.

Analysis of which services are given priority in each group shows that 84.5% of the high income group said that health is their prior concern, 51.7 % rank water next to health and 27.6% of the respondent rank education service as their third requirement. For the middle-income group, 79.4 % rank health as their first need, 47.6% ranked water supply as their second need and 33.8% of the respondents

ranked education as their third need. Responses from low-income group area indicate that 92.5%, 66.7% and 40.9% of the respondent rank health, water supply and electricity service to be first second and third need respectively.

5.2. Existing Water Supply Situation and Demand for Improved Water Service

Source of Water Supply

Responses regarding type of water supply source the household is using indicate that 201 (91.4%) of the sample respondents use piped water and the rest 19 (8.6%) use non pipe water mainly from protected springs. Out of the total 201 respondents that use pipe water only 47 (23.4%) are connected to water lines through private meters and the rest 154 (77.6%) are not. From 154 respondents who do not have their own private connection but using pipe water, 36 (17.9%) use water from venders, 39 (19.4%) use water from shared yard and 79 (39.3%) use public taps. And all respondents who are currently using non pipe water get water from protected spring.

Situation in each income group show that all 59 (100%) of the high income group respondents are using pipe water. 42.4% of them have their own private connection, 13.5% use shared yard connection, 42.4% get water from public taps and only 1.7% use pipe water bought from neighbor venders. 95.8% of the medium income group respondents use pipe water 17.2% of them have their own private connection, 42.2% get water from public taps 21.9% from water vendors and the rest 18.8% use water from shared yard connection. Besides, all medium class respondents who use non piped source (4.5%) get water from protected springs. 83% of the low income group respondents use pipe water. 14.1% of them have their own private connection, 34.6 % get water from public taps, 26.9% from water vendors and the rest 24.4% use water from shared yard connection. Similar to those of the medium class respondents, all low income class respondents who use non piped source (17.0%) get water from protected springs.

Level of Satisfaction with the Existing Water Source

All the sample respondents were asked whether they are satisfied with the existing water service of the town and 65.5% (74.6%, 55.2% and 67.0% from high, medium and low income class respectively) reported that that they are satisfied with the existing water service.

Households that do not have private access to piped water were asked the reason why they did not privately connect to the existing water supply system, and we found that connection cost and house ownership than anything else matter the households' demand for private pipe connection. The following table summarizes households' reasons for not having private pipe.

Table 5.2 Summaries of reason given by households why they did not privately connect to the existing water supply system

Reason	Town Average (%)	Low Income Class (%)	Medium Income Class (%)	High Income Class (%)
High Connection Cost	53.8	68.7	44.6	32.4
No own house	38.7	18.1	53.6	61.8
No need for private pipe	1.7	2.4	-	2.9
Did not yet think about it	5.8	10.8	1.8	2.9

Source, Own Survey, 2008

Among the respondents that use non pipe water, 57.9% said that they use this source because access to pipe water is difficult, 21.1% respond that they use this source because pipe water requires high connection cost, 10.5% of the respondent said that collecting water from public tap takes more time and the rest 10.5% mention different reasons other than those discussed above.

Responses regarding the responsibility of fetching water (only 133 respondents give answer to this question) indicated that 54.9% of the respondents said it is only mother, 27.1% of the respondents said it is the daughter, 11.3% of the respondents said it is the son, 4.6% of the respondents said it is the father and the rest 2.3% of the respondents said it is the daily laborer who are responsible to fetch water from outside source.

Quality, Quantity Reliability and Price of Existing Water Supply

Concerning the quality, quantity, reliability and price of the existing water supply system, the survey results indicate that 44.1% of the total respondent ranked the quality as Very good, 46.4% of the respondents said it is satisfactory, 6.4% of the respondents said it is poor and the rest 3.2% found it difficult to judge.

As to the quantity of water supply, 25% of the total respondent ranked the quantity Very good, 61.4% of the respondents said it is satisfactory, 11.8% of the respondents said it is poor and the rest 1.8% found it difficult to judge.

In terms of reliability, 30.9% of the total respondent said it is Very good, 50.9% of the respondents said it is satisfactory, 8.2% of the respondents said it is poor and the rest 10% found it difficult to judge.

About the price of water 13.2% of the total respondent ranked it cheap, 65.9% of the respondents said it is satisfactory (fair), 7.7% of the respondents said it is expensive and the rest 13.2% found it difficult to judge.

Purification

Responses for question about whether the household uses any purification method such as boiling the water before they use it for consumption indicates that 95.9% (88.1%, 98.5% and 98.9% of households from the high, medium and low income

groups respectively) said that they do not use any type of purification method and 4.6% of the respondents said the use *wuha agar* - scientific method of purification.

The reasons for those who do not use any purification reveal that most of the respondents perceive the water to be clean and they need no purification to use before using the water.

Table 5.3. Summaries of reasons why households use no purification before using water

Reasons	Town Average (%)	Low Income Class (%)	Medium Income Class (%)	High Income Class (%)
The water is clean, need no purification	55.5	73.1	45.5	35.9
The water is not clean, but has no side effect on health	33.7	20.4	37.9	52.8
The water is not clean, but purification is costly and time consuming	7.1	2.2	10.6	11.3
Other reasons	3.8	4.3	6.1	-

Source: Own Survey, 2008

All sample households were also asked whether there is anyone member of the family who has ever been infected by water born disease such as diarrhea, typhoid, cholera or Amoeba in the last one year time. Survey result show that 11.8% (17%, 17.9% and 4.3% of house holds from the high, medium and low income groups respectively) of the respondents said at least one of their family member was sick by one or more of the above four diseases during the last one year.

Water shortage

Concerning the question asked to know whether the household face water shortage, out of the total sample household, 29.6% (6.8%, 23.9% and 47.9% of respondents

from the high, medium and low income groups respectively) said that they faced no water shortage and 70.5% said they had faced. In Combolcha town, a household on average traveled 59 meters and spends 28 minutes (including queue) for one time fetching of water from out side source.

Households who face shortage for reported how they overcame the shortage or where they did get additional water. As it can be seen from table 5.4. most of them get additional water from vendors and then water wells.

Table 5.4. Summaries of source of additional water for households

Additional Water Source	Town Average %	Low Income Class %	Medium Income Class %	High Income Class %
Vendors	52.9	38.8	47.1	70.9
Rivers	3.9	10.2	2.0	-
Springs	9.0	22.5	3.9	1.8
Well	16.8	16.3	25.5	9.9
Other sources	17.4	12.2	21.6	18.2

Source: Own Survey, 2008

Average vender price for water in the town is 21.1 cents for 20 liters water or 10.6 birr for one cubic meter. When this compared to the official tariff rate, which is Birr 2.10 for the 1 to 5 m3 (lowest consumption bundle), it is 505% times greater.

Water Consumption and Expenditure

The average monthly consumption of water for a household is 1.53m^3, which ranges from a minimum of 0.3m^3 to the maximum of 3.75m^3 per month. The average monthly expenditure of a household is Birr 7.10 varying from Birr 0.00 for non pipe water users to Birr 45. When this average monthly expenditure is compared to the average monthly income of a household (Birr 846.6), an average household spends

0.84% of its monthly income on water supply. Though this is with in the range of the World Bank's recommendation, which states a household should not spend more than a maximum of 5% of his monthly income on water; it is far below as well. This implies that households living in the study area can spend more if they are provided with improved water supply.

Average households' monthly consumption and expenditure on the existing water supply across the income subgroups reveal that households from the low income areas consume 1.66 m^3 and spend Birr 8.63 per month whereas households from the middle and high income areas consume 1.35 m^3 and 1.52m^3 per month, and spend Birr 7.45 and Birr 4.24 per month respectively. Alternatively, this is to say that households from low-income areas spend, on average, 2.77% of their monthly income of birr 311.3, whereas from that of middle and high income areas spend 0.96% and 0.24% of their monthly income (birr 779.2 and 1,775.9) on water per month respectively. This shows that households from the low-income groups spend more compared to the middle and high income class. The reason is that since they have almost no access to private pipe water, relative to the others, these low income households usually buy water from venders (whose price is higher than the official tariff).

General Attitude of the Respondents

Responses regarding the attitude of the respondents towards the responsibility to provide water to the town indicate that out of the 220 respondents, 201 (91.4%) think that the government should be responsible, 16 (7.3%) said that the responsibility should be given to the people (community) of the town and the rest 3 (1.4%) said it is the responsibility of individuals. Moreover, almost all the respondents said that the current water supply service should be improved as it will minimize the risk of water interruptions.

5.3. Demand to Connect and Willingness to Pay

Households' Demand to Connect Private Meter

Responses about whether the household is willing to have a private connection to the new improved water supply under the given hypothetical market show that 217 (98.6%) of the total sampled household are willing to have private connection to the new improved water supply services, and only 3 (1.4%) are not willing to have access to the new system.

From the 217 respondents 44 (20.3%) already have private pipe, 173 (79.7%) are with out it; 173 is a summation of 39 (18%) from shared yard, 79 (36.4%) from public tap, 36 (16.6%) from those who bought water from vendors (neighbors), 19 (8.8%) from non pipe water user.

Examining it across religion, sex, water source, education, employment and income categories demonstrate that; 134 (91.5%) Muslims, 83 (98.8%) Christians; all 162 (100%) males, 55 (94.8%) females; 19 (100%) of non pipe water users, 198 (98.5%) pipe water user; 143 (99.3) with secondary or college education, 74 (97.4%) with lees than secondary education; 96 (99%) formal employees, 121 (98.4%) self employed and/or unemployed; and 57 (96.6%), 67 (100%) and 93 (98.9%) high, medium and low income group are willing to connect private tap.

Willingness to Pay for Improved Water Service

From the total sample of 247, only 31 (12.6%) respondent are not willing to pay any amount. To know the reasons why they are not willing to pay any amount, and thus to decide whether their response is protest zero or true zero, a follow up question was asked. Accordingly, 4 respondents reasoned that they have no the ability to pay and government should pay. Therefore, we can say that the responses are considered as true zeros. The rest 27 (10.9%) are not willing because they are satisfied with the

existing water service. Therefore they are judged to be protest zeros and are rejected from the analysis.

For the valuation question five starting values were chosen based on the modes of their occurrence during the pretest survey. These prices are 0.10, 0.15, 0.20, 0.25, and 0.30 cents per a 20 liters jerry can and 39, 66, 47, 36, and 29 respondents were randomly given the respective starting price for the biding game. From the survey, all 39 (100%) respondents who were given 0.10 cent as a starting price respond a yes for the bid. Out of 66 respondents, 58 (87.9%) gave a yes response for 0.15 cents bid per a 20 liters jerry can. Out of 47 respondents 37 (78.7%) gave a yes and no answer for the 0.20 cents bid. From 36 respondents who are given 0.25 cents, 23 (63.9%) gave a yes response. Whereas of the 29 respondents, 13 (44.8%) gave a yes response for 0.30 cents.

Reported Maximum WTP

Table: 5.5 reported maximum willingness to pay from open ended format

Maximum WTP reported/20 liter jerry can (in cents)	**Frequency**	**Relative frequency (%)**	**Cumulative (%)**
0.00	4	1.8	1.8
0.05	7	3.2	5.0
0.10	69	31.4	36.4
0.15	63	28.6	65.0
0.20	41	18.6	83.6
0.25	23	10.5	94.1
0.30	13	5.9	100.0
Total	220	100.0	

Source: Own Survey, 2008

Mean Maximum WTP for the total number of households in the sample, 220, is 15.70 cents per 20 liters jerry can. This means that, on average, the respondents are willing to pay birr 7.85 for one m^3 of improved water service which is about 0.93% of the average income of the sampled Households (birr 846.6) and is greater than even twice of the towns' existing highest consumption block tariff. This implies that the residents of the town are willing to pay more than the existing tariff rate.

Of the three clusters, we obtained the highest mean WTP of 17.46 cents in from high-income group. The mean WTP obtained from the middle and low income groups are 15.37 and 14.84 cents per the 20 liters jerry can respectively. This result goes in line with the theory that higher income households are more willing to pay for improved water service than low-income households.

Review across religion and sex show that the mean WTP of Muslims and Christians (non Muslims) are 14.96 and 16.90 cents respectively and Male household heads have a mean WTP of 15.96 and the Female heads 15.0 cents per a 20 liters jerry can.

Mean WTP of respondents by their education level indicate that, household heads with formal education (above grade nine) give a mean value of 16.57 whereas those with less or equal to elementary education give mean WTP of 15.0. This implies that those household with formal education of above or equal to secondary education are more willing than their counter parts. Likewise, the mean WTP of respondents by their occupation discloses that, household heads working in governmental and non governmental organizations give a mean value of 16.39 whereas those with out job and are not working for salary (jobless and self employed) give mean WTP of 15.16. And mean WTP for pipe water and non pipe water users is 15.72 and 16.58 cents respectively.

This shows that high income groups, non Muslims, Male household heads, household heads with secondary or college education, household heads working for

salary, and non pipe water users are found to be more willing to pay for the improved water than their respective counter parts.

5.4. Determinants of Willingness to Pay for the Improved Water Service

In this section results obtained from probit estimation are presented. We use discrete approach to determine the key factors that explain the probability of a household to choose the new improved water supply system. In order to examine this, we employ probit model. Prior to our estimation we made multicolliniarity test to determine whether the explanatory variables are correlated to each other. And the result ensures that our data is free from multicolliniarity problem.

The likelihood ratio for the estimation model of $\chi^2(17)$ equal to 53.45 indicates that the overall model is a good fit. The pseudo R^2 of 22.67% shows that the regression explains 22.67% of the total variation, implying there are other explanatory variables, in addition to those included in our study, which can also have an effect on the probability of households' willingness to connect private pipe from the new improved water service.

Religion of the Head of the Household

The variable religion of the head of the household has a positive effect. It implies that Muslims are more willing than Non Muslims to pay for the improved water service. But this variable is statistically insignificant. This is contrary to our descriptive analysis results.

Income of the Household

This variable is consistent with our expectation: it has a positive outcome and significant at 5% signify that income of the household as the main determinant of willingness to pay for water. The result confirmed the economic theory that income and quantity demand are positively related. Our survey depicts the fact that high

income households are more willing than the low income households. Our result agrees with findings from Nigeria (Alaba, 2001), the republic of Peru (Fujita et al., 2005) and Ethiopia (Fisseha, 1997, Assefa, 1998, Dunfa, 1998, Genanaw, 1999, Gossaye, 2007). This implies that remaining other things constant if the average monthly income of the household increases say by 1 birr year, the probability of household's willingness to pay for the improved water service increases by 0.01473 percentages.

Age of the Head of the Household

As we expected the age of the head of the household has a negative indication and is significant at 10%. Aged households in Combolcha town are less willing than their counter parts. This implies that remaining other things constant if the age of the head of the household increases say by 1 year, the probability of household's willingness to pay for the improved water service decreases by 0.47 percentages. This might be due to the fact that old people may attach themselves to the status quo. The result confirms with studies of Kaliba (2002) in Tanzania, Fujita et al. (2005) in the republic of Peru, Medhin (2007) and Gossaye (2007) in Ethiopia.

Sex of the Head of the Household

Contrary to our expectation the sex dummy variable has positive effect. Denote that male household heads are more willing than females. This can be attributed to the reason that many female household heads earn less income than the male household heads, and are less willing to pay for the new improved water. But this variable is found insignificant.

Table 5.6: Summery of Probit estimates for the determinants of WTP for improved water supply service in Combolcha town, single bounded dichotomous choice elicitation format

Variable	Coefficient	Marginal Effect	Std. Err. of the Marginal Effect	P Value
RELG	0.0950538	0.0245113	0.07238	0.735
DURTN	-0.0088395	-0.0022556	0.0022	0.306
SEX	0.3392431	0.0929701	0.07655	0.225
AGE	-0.0185947	-0.0047448	0.00267	0.076***
HHs	-0.0722188	-0.0184282	0.02415	0.446
DPR	-0.2405889	-0.0613915	0.05746	0.285
INC	0.0005773	0.0001473	0.00007	0.026*
WATS	-0.2053069	-0.0481781	0.08347	0.564
TIME	0.0034749	0.0008867	0.00146	0.544
SAT	0.1306271	0.0339642	0.06425	0.597
BID	-6.121854	-1.562126	0.43487	0.000*
HOUSE	-0.0436661	-0.0111966	0.0669	0.867
ATTITU	1.147347	0.3928348	0.15216	0.010*
EDUC	0.3533922	0.0886334	0.0715	0.215
OCCUP	-0.2635284	-0.0682071	0.07286	0.349
EXPNDR	0.0109284	0.0027886	0.00412	0.498
QUAL	-0.1098692	-0.0282059	0.06886	0.682
CONSTANT	1.598081	-	-	0.080
			Prob > chi2 =	0.0000
No. of observations = 220			*LR chi2(17)* =	53.45
Log likelihood = -91.18597			*Pseudo R2* =	0.2267

Source: Own Survey, 2008

, **, * indicate that the variable is found significant at 1%, 5% and 10% significant level respectively*

Wealth

In this study ownership of house is used as a proxy to wealth and it is found negative but insignificant. It indicates that those households who are living in their own houses are less willing to have private connections from the improved water service. This may be due to the fact that, as we observe the descriptive analysis, majority of the low income sample households own house and their income constraints may oblige them to be reluctant to pay for the new water service.

Household Size

The variable household size has a negative effect as expected. This suggests that willingness to pay for improved water service decreases as household size increases. This is due to the fact that as the household members are large, the household will have idle labor to fetch water. Together with, the household per capita income would also be decreased leading the household to be reluctant for additional outlays. It is insignificant.

Dependency Ratio

The variable dependency ratio has a negative indication as expected, illustrating that the more the number of dependants in the household the more the burden of the productive members of the household and therefore willingness to pay for the improved water service is low. Again decrease in the household per capita income would lead the household to be unwilling for additional outlays. It is insignificant.

Household's Year of Stay in the Town

The effect of the variable household's year of stay in the town is negative but insignificant. This means that the longer the household stayed in the town, the less the willingness to pay for the new improved water service. This implies that households that live in Combolcha town for many years are less willing than their

counter parts. This might be due to the fact that these people firmly attach themselves to their prior water source and are not ready for change.

Occupation of the head of the household

Contrary to our expectation the effect of the variable occupation of the head of the household is found negative but insignificant. This signifies that formally employed household heads are less willing, than their counter parts, to pay for the improved water service.

Initial bid (Starting Price for the Bid Game)

The coefficient of Initial bid has negative signal and strongly significant at 1%. The negative sign and the significance of this coefficient indicate that as the starting bid price increases say by 1 cent, the probability of household's willingness to pay for the improved service reduces by 156 percentages.

Attitude of the Respondents towards the responsibility of water provision

It has a positive effect and is significant at 1%. This result connotes that respondents who give the responsibility of town water provision to government, in contrary to their suggestion, are more willing to pay for the new improved water service.

Education level of the Head of the Household

The variable education level of the head of the household is found positive but insignificant. In line with our expectation it discloses that households with secondary and/or college education are more willing than their counter parts.

Monthly Expenditure for Water

The variable expenditure for water consumption is positive but insignificant. It reveals that households who pay for water from the existing source are more willing to pay for the new improved water service.

Source of Water for the Household

As we expected, the variable Source of water the household is using has a negative indication but is insignificant. It exhibits that households using non pipe water are more willing to pay for the new improved water service.

Time taken to fetch water from the existing water source in minute

The variable time taken to fetch water from the existing water source has a positive effect but insignificant. This connotes that respondents who spent much of their time to fetch water are more willing to pay for the new improved water service.

Level of Satisfaction with the existing water supply service

Contrary to our expectation, the variable level of satisfaction with the existing water supply service is positive but insignificant. It reveals that households satisfied with the existing water supply are willing to pay for the new improved water service.

5.5. Mean Willingness to Pay

Mean Willingness to pay (MWTP) using the probit model for the close ended (dichotomous choice format) question is determined as follows:

MWTP = - Constant/Bid Coefficient

= - 1.598081/-6.121854

= 26.10 cents

The MWTP calculated from the close ended probit model is 26.10 cents per 20 liter jerry can water from the new improved water service. This is greater than 15.70 cents and the results of Kinfe (2007) and Gossaye (2007), but implying that the mean willing ness to pay for the new improved water service of households in Combolcha town is between 15.70 and 26.10 cents: which is by far greater than the existing water tariff of the town.

CHAPTER SIX

6. CONCLUSIONS AND POLICY IMPLICATIONS

6.1. Conclusion

This paper analyzed the household demand and determinants of willingness to pay for improved water service in Combolcha town, South Wollo, Ethiopia. The study used primary data obtained from a contingent valuation survey of 220 households. Where the survey is administered using enumerators to contact sampled households with structured questionnaire.

We used a single bounded dichotomous choice followed by open ended elicitation technique. In the close ended format respondents are asked for a yes or no question for a given bid which varies across the sample; whereas in open ended question respondents choose a no answer were asked to state their maximum willingness to pay amounts for the proposed service.

We used both a descriptive and econometric analytical technique. The probit model is used to examine the influence of different socioeconomic, demographic and water service variables on the willingness to pay of the respondents.

The descriptive analysis showed that average age of the respondents is 43.9 years, average family size is 4.1 with average monthly household income of 846.6 birr. Of the 220 respondents 201 (91.4%) of the respondents; all high income, 95.8% of the medium and 83% the low income groups reported that they use pipe water from the existing service the rest 19 (8.6%) use non pipe water mainly from protected springs. Out of the total 201 respondents that use pipe water only 47 (23.4%) are connected to water lines through private meters. From 154 pipe water user respondents but who do not have their own private connection, 36 (17.9%) use water from venders, 39 (19.4%) use water from shared yard and 79 (39.3%) use public taps.

About 65.5% of the respondents said that they are satisfied with the existing service, 70.5% reported that they had faced water shortage 11.8% said at least one of their family member was sick by one or more the water related diseases during the last one year and only 4.6% of the respondents purify water before use using *wuha agar*.

The average monthly consumption of water for a household is $1.53m^3$, which ranges from a minimum of $0.3m^3$ to the maximum of $3.75m^3$ per month. The average monthly expenditure of a household is Birr 7.10 ranging from Birr 0.00 for non pipe water users to Birr 45 and is an average of 0.84% the monthly income of households. Responses regarding the responsibility of fetching water indicated that water fetching is the burden of female household members; 54.9% of the respondents said it is the responsibility of mother and 27.1% said it is the daughter's.

Regarding the attitude of the respondents towards the responsibility to provide water to the town majority of the respondents 201 (91.4%) think that the government should be responsible.

Responses to the valuation questions revealed that 98.6% of the respondents expressed their willingness to have private connection to the new improved water and are willing to pay for the new service with mean WTP of 15.70 cents. This implies that, on average, the respondents are willing to pay birr 7.85 for one m^3 of improved water service which is greater than even twice of the towns' highest consumption block. Only 1.4% of the respondents are not willing to pay for the improved water service. Moreover, only 12.1% of the respondents are not willing to have private connection to the improved water service.

Results from the probit model show that income, initial bid, and attitude of the respondent as to the responsibility of town water provision have positive effects and age of the head of the household has a negative effect on the households' choice for improved water services. This implies that households with high income are more likely to choose improved services. However, there is a tendency for aged households

not to choose the improved water service. Mean willingness to pay for the probit model is 26.10 cents per 20 liters water, which implies that the mean willingness to pay for the new improved water supply ranges between 15.70 to 26.10 cents.

6.2. Policy Implication

Since the existing water supply system of Combolcha town can not satisfy the existing demand, people are forced to buy water from vendors at higher prices. However if new improved water service is supplied households with private meter connection, it increases revenue of the town water supply office by increasing the water tariff, since households are willing to pay more than the existing rates. As households' WTP for the new improved water is more than the existing tariffs of the town, the possibility to implement the cost recovery strategy is evident.

More specifically, based on our findings, we can draw the following policy implications:

The high WTP more than the existing tariffs amount for the improved water supply make clear that the town's water supply officials can establish full cost recovery strategy to address the acute water needs of the people.

In our study we found that most of the respondents are willing to pay the full cost of providing the improved water supply. An important policy implication from this finding is that if the proposed water improvement service is implemented, the town's water supply service could earn more revenue which makes it capable of providing highly reliability water service.

The strong positive relation ship between household income and willingness to pay to the improved water service discloses that there is a need to high income people for having private connection to the new improved water supply. We can derive an

important policy implication that there is a need to consider household's income level in designing policies related to supply of improved water services.

The negative relation between the age of the head of the household and the willingness to pay to the improved water service imply that there is a need to consider household's age in designing policies related to supply of improved water services.

An important policy implication of the high amount of WTP we obtained in our study is that the existing tariff is set below the people's WTP, which indicates the consideration of the willingness to pay of the beneficiaries in setting tariff for water supply. Besides, since WTP is affected by income of the household, tariff setting should regard (never undermine) the poor income group to have access to the minimum water requirement to sustain life.

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Annnex A

Questionnaire designed to assess the Household Demand and Willingness to Pay for Improved Water Service in Combolcha Town

Name of the interviewer_____

Date of Interview_____

Kebele Number_____

House Number_____

Respondent's Code No. _____

Note for the Interviewer

- Instructions are written in block letters
- Lower case letters are questions and statements to be read aloud to the respondents

Introduction to the respondents

This survey is being undertaken by a student of Addis Ababa University, as a partial Fulfilment for the Requirement of the Award of MA Degree in Regional and Local Development Studies (RLDS). This questionnaire is designed to obtain information on the current water supply situation of the Combolcha town and the resident's willingness to pay for an improved water service.

To well achieve our objective, we demand to talk with local people (residents) about their current water practice, as well as asking them whether they are willing to own private pipe water connection, and whether they are prepared, able and willing to pay for it.

The interview will take few minutes and the information collected is purely for academic purpose and will be kept confidential. We particularly would like to discuss with the head of the household and/or spouse. Your name and personal information will never be linked with your responses. Hence, you are requested to give your true answers to the interviewer as much as you can.

Section A: Socio – Economic and Demographic Characteristics of the Household

1. Respondent's religion _____
2. How long have you been living in this town? _____years/_____ months
3. How many people, including your self, live in this household? _____
4. Would you tell us the age, sex, education level, occupation and monthly income of your family members please?

Note to the Interviewer:

- Record (Fill) the answers for question 4 above in the following table
- Start recording from the respondent him/herself
- Write in the following code numbers in the relationship column
  - **1. If Father**
  - **2. If Mother**
  - **3. If Daughter**
  - **4. If Son**
  - **5. If Servant or House Guard**
  - **6. If Brother or Sister of the Head of the Household**
  - **7. If Others**
- Write Age , Occupation and Monthly Income of the member in the space provided
- Put tick marks for Sex and Education in the appropriate column
- If the space provided below is not enough, use the back side of the paper

No	Relationship	Sex		Age	Education				Occupation (if any)	Monthly Income
		M	F		Elementary	High School	College/ University	Other		
1										
2										
3										
4										
5										

5. Do you have another source of Income apart from your permanent occupation?

    1. Yes
    2. No

6. If your answer for question number 5 is **yes,** how much do you earn/get per month?

_____

7. Do you rent or own this house?

    1. Privately owned
    2. Rented from Private Owners
    3. Rented from Kebele (Government)
    4. Owned by Host Organization you worked for
    5. Other, please specify _____

8. Please tell us your average monthly expenditure for the following items

    1. Food _____
    2. House rent _____
    3. Electricity _____
    4. Telephone _____
    5. Transportation _____
    6. Education fee _____
    7. Miscellaneous_____

Section B. Existing water supply Questions

1. What is your household's main source of water for domestic purpose?

    1. Piped water
    2. Other, please specify _____

If respondent's answer for question 1 above is piped, go to question 2 to 46 then to Section C

If respondent's answer for question 1 above is others, go to question 47 to 68 then to Section C

Piped Water Questions

2. If you use piped water, what kinds of pipe do you use?
    1. Shared yard connection **(go to question 3 to 8 then to 36)**
    2. Public taps **(go to question 9 to 18 then to 36)**
    3. Water bought from neighbours **(go to question 19 to 28 then to 36)**
    4. Private connection **(go to question 29 to 36 then to 36)**
    5. Other, please specify_____

Shared yard connection

If you use shared yard connection water

3. How many households use the yard connection? _____Households
4. How much water, on average, do you use per day? _____ Litres.
5. How much do you pay per jerry can (a 20 litres container)? _____
6. Are you satisfied with the existing water service?
    1. Yes
    2. No
7. If your answer for question 6 above is **No**, what is/are your main reason(s)

    _____

    _____

    _____
8. Why don't you have your own connection?
    1. High connection cost
    2. The house is rented
    3. You don't want to have private connection
    4. For other reason, Please specify_____

Public tap

If you use public tap water

9. How much time on average do you spend to fetch water from the public tap at a time?

    _____ minutes/hours
10. How many times, on average, do you go to fetch water per day? _____ times

11. How far is the water source from your home? _____ metres

12. How many persons go to fetch water at a time? _____ persons

13. Who often go to the public tap to fetch water? **(Note to the Interviewer: If you get multiple responses put circle for all of them)**

    1. Father
    2. Mother
    3. Daughter(s)
    4. Son(s)
    5. Other, Please specify _____

14. How much water, on average, do you use per day? _____ Litres.

15. How much do you pay per jerry can (a 20 litres container)? _____

16. Are you satisfied with the existing water service?

    1. Yes
    2. No

17. If your answer for question 16 above is No, what is/are your main reason(s)

_____

_____

_____

18. Why don't you have your own connection?

    1. High connection cost
    2. The house is rented
    3. You don't want to have private connection
    4. For other reason, Please specify_____

Water bought from Neighbours

If you use water bought from Neighbours

19. How much time on average do you spend to fetch water from this source at a time?

_____ minutes/hours

20. How many times, on average, do you go to fetch water per day? _____ times

21. How far is the water source from your home? _____ metres

22. How many persons go to fetch water at a time? _____ persons

23. Who often go to fetch water? **(Note to the Interviewer: If you get multiple responses put circle for all of them)**

    1. Father
    2. Mother
    3. Daughter(s)
    4. Son(s)
    5. Other, Please specify _____

24. How much water, on average, do you use per day? _____ Litres.

25. How much do you pay per jerry can (a 20 litres container)? _____

26. Are you satisfied with the existing water service?

    1. Yes
    2. No

27. If your answer for question 26 above is No, what is/are your main reason(s)

_____

_____

_____

28. Why don't you have your own connection?

    1. High connection cost
    2. The house is rented
    3. You don't want to have private connection
    4. For other reason, Please specify_____

Private Connection

If you use private connection water

29. How much water, on average, do you use per day? _____ Litres.

30. How much do you pay per jerry can (a 20 litres container)? _____

31. How many times, on average, do you go to fetch water per day? _____ times

32. How far is the water source from your home? _____ metres

33. Do you know the existing water tariff rate of the town?

    1. Yes
    2. No

34. Are you satisfied with the existing water service?

1. Yes
2. No

35. If your answer for question 30 above is No, what is/are your main reason(s)

_____

_____

_____

36. How do you rate the quality of piped water?

1. Very good
2. Satisfactory
3. Poor
4. Difficult to judge

37. How do you rate the quantity of piped water?

1. Very good
2. Satisfactory
3. Poor
4. Difficult to judge

38. How do you rate the reliability of piped water?

1. Very good
2. Satisfactory
3. Poor
4. Difficult to judge

39. How do you rate the price or tariff of piped water?

1. Very good
2. Satisfactory
3. Poor
4. Difficult to judge

40. Did you or do you face water shortage?

1. Yes
2. No

41. If your answer for question 36 is Yes, how do you overcome the shortage/where do you get additional water?

1. From Vendors
2. From Rivers
3. From Springs
4. From Well
5. From Other sources, Please specify_____

42. Does your Household use any purification method to clean piped water before use?

1. Yes
2. No

43. If your answer for question 38 above is Yes, what method do you use?

1. Traditional
2. Innovative

45. If your answer for question 38 above is No, what is your reason?

1. The water is clean, need no purification
2. The water is not clean, but has no side effect on health
3. The water is not clean, but purification is costly and time consuming
4. Other reasons, Please specify _____

46. Does any one of your family members suffered from any of the following water related diseases during the last one year?

A) Diarrhoea?

1. Yes 2. No

B) Typhoid?

1. Yes 2.No

C) Cholera?

1. Yes 2.No

D) Guardia / Amoeba?

1. Yes 2.No

Now go to the Willingness to Pay Questions (Section C)

Section C: Household Willingness to Pay for Improved Water Supply

Interviewer: Please read the following introduction statement to the respondent aloud

Opening statement

We want you to consider the following hypothetical improvement to your current water supply situations. It is crucial that you answer honestly. If you and others suggest that you will pay more than you are able to, you may not be able to afford the improvement. Please be truthful in stating your willingness to pay for improved water supply.

Suppose you have an alternative to have a private connection which assures you

- Good quality of water which is safe for Health
- Good quantity of water available for 24 hours a day, through out the year
- Time saving and reliable water service

But to enjoy the improved service (private connection) all household of the town, who wants to have it would have to pay initial investment costs and running (maintenance) cost, which would be added to their monthly water bill. Assume you will be charged a monthly water fee based on the volume of water your household consumes in the month. The tariff per volume will be the same for all consumers but are a bit higher than the current tariffs.

Willingness to pay Questions

1. Are you willing to participate in this programme?
    1. Yes
    2. No

Interviewer: If the answer for question 1 above is No, go to the General Questions

2. If your answer for question 1 above is Yes, would you pay _____cents per jerry can for the improved service?
    1. Yes
    2. No

If the answer for question 2 above is Yes, go to the General Questions

DECLARATION

I, the undersigned, declare that this thesis is my original work, has never been presented for a degree in any other university and that all sources of materials used for this thesis have been dully acknowledged.

Declared by:

Kedir Mussa
Candidate

Signature_____
Date _____

Confirmed by:

Dr. Aklilu Amsalu
Advisor

Signature_____
Date _____

Place and Date of Submission: Addis Ababa University, 23 June 2008.