1. INTRODUCTION

In developing countries the fundamental issues of social sector are gaining prominence. The basic needs of the public, particularly the rural poor continue to attract the attention of planners and policy makers. The basic needs include inter alia primary education, health care, safe drinking water, sanitation, housing and roads. These basic provisions are intrinsic to community development and in turn economic development of the rural poor. Development unmindful of these primary requirements will be incomplete and lopsided. Provision of potable water to rural mass is a case at issue. This is important due to the fact that access to safe water has a direct bearing on the health of the poor, particularly the rural poor.

The fact remains that the total water on earth is limited; continuous pressure from agricultural, industrial and domestic sectors leads to qualitative and quantitative problems to this finite and fragile natural system. Of the total water resources present on earth, 97 per cent is confined to oceans, 2 per cent got locked as ice and just one percent is available for direct human use as freshwater. A major chunk of our nation’s water, as high as 84 percent goes for agricultural activities; 12 per cent is utilized for industrial and energy sectors and the remaining 4 percent for domestic purposes (Jyothi and Kirit, 1999).

Provision of potable water on a sustainable basis is a basic necessity. Concerted efforts have been made both at the center and state levels right from the first Five Year plan period. But yet nearly 15 per cent of the total population is left with little access to safe water. A management of water resource towards provision of water with adequate quantity and acceptable quality for drinking purpose is a stupendous task. Indeed the issues pertaining to water supply system are so profound starting from socio-economic problem, environmental, institutional, financial and human resource management.

The percentage of population with little access to safe water constitutes one of the three major variables based on which deprivation index is arrived at.
Deprivation index forms one of the three main indices of human poverty index. In the deprivation index, besides access to safe water, the percentage of the population with little access to health services and the percentage of the under weight children under the five year age group were also taken into account. The average of the three variables is considered in the preparation of deprivation index (Thirlwall, 1999). The fact that lack of access to safe water to the poor is a crucial variable in deprivation index emphasizes the involvement of human factors along with technological problems in water supply and sanitation programmes.

While all the water supply schemes generate assets such as bore well, piped water supply through overhead tank and hand pumps etc., the question of their operation and maintenance merits research investigation. Another issue pertaining to water collection is the role of women. It has been the legacy; particularly in rural area women continue to be subjected to the hardship of traversing long distances to collect water. In this context one of the major challenges is to initiate gender sensitive strategies, thereby reducing the burden of water collection and to involve them to participate in water management.

Ultimately the problem of rural water supply (RWS) revolves around provision of water on a sustainable basis, which is a many-folded issue. Provision of water to the target groups on a continuous basis is central to it. Corollary to this is depletion of ground water; a finite natural resource constrained to be over exploited to meet the requirements of increasing population. And the deterioration of water quality, both due to natural conditions and human interventions, is a matter of serious concern. Achieving sustainability here envisages provision of water without gaps, without depleting the natural resource and without causing water borne health hazards to users.

An organized role of local communities is appropriate from the perspective of environmental economics (Harou et al., 1998). Community participation in water supply assumes significance because after all the users may have to accept their responsibilities. It is to be remembered that community participation does not simply mean adopting the decisions ratified by the local people. In a strict sense, it means participation in decision-making and management processes; such an involvement to become really involved need be built over time.
Water quality and human health are directly related issues. Improved water quality and increased quantities and adequate sanitation* facilities would bring forth health benefits. Improved water supplies mitigate the incidence of many water-borne diseases. It is worth quoting Halfdan Mahler, former Director General of the World Health Organisation (WHO), who said,

'The number of water taps per 1000 persons is a better indicator of health than the number of hospital beds' (Sachchidananda, 1999: p.14).

Safe water eliminates the infective agents associated with water-borne diseases. Availability of greater quantity of water can improve health by allowing improved personal hygiene and sanitation.

Economic aspects of providing drinking water to the public unfold a number of issues. At present, modern program ipso facto mission approach is central to water supply and sanitation. This necessarily involves capital investment by the Centre or the State towards creation of sources. It is the operation and maintenance costs that can keep the systems function on a regular basis. In this regard the following questions arise:

- Whether "demand responsiveness" or supply oriented factors which one is crucial for expansion of provision of this basic service?
- What is the extent of subsidy involved in providing water to rural poor? Are there cross-subsidies between urban and rural and the rich and poor?
- If cost sharing is agreeable in principle what is the rationale behind calculating tariff for rural water supply?

However uniform tariff rates may affect the poor more than the rich. Hence there is a need to strike a balance between economic value of water to users, the cost of providing services to users and the prices charged for these services.

* The term sanitation does not confine to latrines alone, it encompasses personal hygiene, proper garbage disposal, drainage system and community well being.
Improvements in water provision can be a crucial factor in controlling water-borne diseases and improving living conditions, especially in a country like India where a sizable portion of the population is constrained to live with inadequate supply of water. The prime aim of the International ‘Drinking Water Supply and Sanitation Decade (1981-1990)’ is to make potable water accessible to as many households as possible. On the one hand domestic water supply serves as a basic component of welfare in its role as a direct consumer commodity and on the other hand it acts as an element of socio-economic infrastructure. Provision of an adequate amount of domestic water supply may result in community stability that may stimulate success of other components of development (Biswas, 1987). Notwithstanding the fact that success in economic activities depends on host of other factors, inadequate water supply can be a significant constraint.

1.1. Statement of the problem

Despite the efforts made at the central, state and local bodies level, nearly 16 per cent of the population in our country has not been covered with safe water, more so with sanitation. Even where provided, there are numerous inroads in the distribution and maintenance of the sources. Provision made by the state and the problems thereof are just tip of the ice burg. The socio, economic, technological and environmental issues involved are profound, as many of them still remain unresolved. Whether water is treated as an economic good or social good or both. Whether the provision need be demand responsive or supply based. What is the extent of subsidy the state can provide for rural water supply? If cost sharing is agreeable in principle, whether to start with sharing capital cost or sharing operation and maintenance cost. Who should decide on the technology and its cost if costs are to be shared? The role of women and the community participation in managing water supply unfolds issues like time spent, distance traveled and the involvement of local people in organizing the facility.

As stated earlier provision of potable water to the rural population is a multifaceted problem. The need of the hour is to develop a framework for improved water provision on a sustainable basis. The traditional approach was characterized by central decision making, external determination of requirements rather than “economic demand” for service, absence of cost-sharing arrangements, greater
involvement of government machinery rather than local participation in deciding location, installation, operation and maintenance of water supply. The launching of a National Drinking Water Mission in 1986 later came to be known as the Rajiv Gandhi National Drinking water Mission, witnessed a paradigm shift from 'supply oriented' approach to 'demand responsive' method. This implies a switch over to modern method from traditional approach, which assumes socio and economic significance.

A crucial question is the quantum of water required for domestic purpose, (the fixed norm of 40 liters per capita per day) and the rationale behind the norm. Then comes the question of convenient distance within which the sources need to be located. Whether the number of hand pump/stand post for every 1000 persons is distributed equitably across the study district. Choice between three different major sources such as a) traditional sources like springs, wells, lakes, river and tanks; b) mechanical “contravention” brought from outside the villages like hand pumps and c) very advanced systems like piped water supply and water treatment plant like desalination plant. The whole question is whether to treat all the systems together as one and adopt holistic method to manage them towards better provision of water. Modern approach is a package consisting of five different stages viz., identification of suitable sources, adopting systematic methods of drilling deep bore wells, putting up the hand pumps to bring the water above the surface, create hygienic atmosphere around the source by providing platform, drainage facility, soaking facility and finally proper operation and maintenance of the above items. If problem occurs in any one of the stages the systems go defunct. More important is the question of sustainability of maintaining the level of consumption and quality of water. Is the quality compatible to the standards fixed by the WHO? What are the health problems of polluted water consumption? Sustainability is achievable if and only if the people at large participate in resource mobilization and in cost sharing towards water supply. On top of everything, the awareness of people about the linkage between health and safe drinking water. What is the rural water supply pattern in India that emerged from NSSO 54th round?

Water use plays a crucial role in ensuring socio-economic development particularly when it fulfills domestic purposes. The present study title, albeit, reads drinking water supply, does not envisage water for drinking purpose alone. The
context is much wider in terms of water use in domestic sector. At household level water is required for various different purposes like cooking, bathing and washing etc.

1.2. Objectives of the study

The present study in the chosen study area sets out the following objectives to:

- discern the rural water supply (RWS) with the help of secondary sources of information to understand the pattern of water use at the study district and all India level.

- analyze the cost aspects, factors influencing water use, distance traveled, time spent and the participation of rural households in organizing and availing the services in the select villages.

- understand the environmental dimensions of drinking water at the village level with respect to depletion of natural resource, degradation of water quality, and the vulnerability of women and children to degradation of environment

- outline an alternative method of calculating tariff for rural water supply.

1.3. Hypotheses

I. The respondents used the modern schemes as a principal source and traditional source as a supplementary source for collecting water for different consumption purposes (NSSO 54th round).

II. All the regions received potable water for drinking and cooking purposes in equal proportion.

III. The family size, land holding, per capita income, female head education, occupation, house value, area (wet, mixed, dry and hill) cooking trip per day, distance and time are the key determinants of consumption of water.
IV. There is relationship between environmental degradation in terms of depletion of natural resource viz., the ground water level and the burden of women in general and children particular.

1.4. Methodology

In order to realize the set objectives, Tiruchirappalli district in the state of Tamil Nadu is chosen. This is one of the thirty districts in the state, comprising 8 taluks, 14 blocks, 408 village Panchayats and 2376 habitations. Of which 311 sample village households were selected across 4 taluks, 4 blocks, 5 village Panchayats and 46 habitations.

1.4.1 Method of sample selection

The present study has used multistage sampling methods viz., systematic proportionate stratified random sampling method to select the sample villages. The criteria adopted to stratify the five select villages to choose 311 households includes the following ecological zones area irrigated, area, less irrigated, area, which is partially irrigated and partially less irrigated, and Hilly area with special characteristics such as village where schedule caste/tribes are concentrated. Totally five villages were selected and grouped under four categories viz., Wet, Mixed (partially wet & partially dry), Dry (arid) and Hilly region. In the three select villages, of the total households of each village 10 per cent of the sample households are chosen. In the case of the remaining two villages, where the characteristics are mixed, only 5 per cent of the sample households are chosen from the total (see figure.1).

Household list and caste particulars are collected from the village Panchayat office. From this list landholders and land less particulars are obtained from the Village Administrative Officer (VAO). Total population (households) is classified on the basis of community like Schedule Caste / Tribes (lower caste) and Other Community (upper caste), community and land holding wise percentage was calculated to total population.
Figure: 1

Tiruchirappalli District

8 Taluks

Wet

Mixed

Hilly Region

Dry

8 Blocks

Lalgudi

Thotliyam

Thuraiur

Manapparal

4 Blocks

Athikudi 10% of total HHs

Mulipad 5% of total HHs

Nagaralor 5% of total HHs

Othukkili 10% of total HHs

4 Blocks

Lalgudi

Thotliyam

Uppliyapuram

Marungapuri

408 Village Panchayats VP

5 VP

Thenpuranadu 10% of total HHs

64 Sample HHs based on land holding,& community

46 Sample HHs based on land holding,& community

74 Sample HHs based on land holding,& community

2376 Habitations

46

67 Sample HHs based on land holding,& community

311 Sample HHs

60 Sample HHs based on land holding,& community
Landless and landholders are the two major classifications. The landholders are then divided into groups less than 1.1 to 2.5 acres, 2.51 to 4 acres and above 4.1 acres. The selected 10 per cent of sample households is proportionate to the actual percentage of landholdings by the households across communities to the total village households.

Athikudi represents wet area, Oothukuli for dry area; Nagayanallur and Mullipadi represent area for partially wet and partially dry (mixed) conditions. And Thenpuranadu happens to be located at a hill station, where the concentration of schedule caste and schedule tribes is high, which is the fifth village chosen for study. Analysis of data is carried out at two levels. One at the habitation wise based upon secondary sources of information and the other at the household level with the help of primary data collected from field survey. Essentially statistical tools such as Analysis of Variance and Regression model and the t' test are used.

1.4.2 Data source

Secondary information on the status of drinking water provision at Tiruchirappalli District, the district chosen for study, across 2376 habitations were collected from the Tamil Nadu Water supply and Drainage (TWAD) Board. These habitations are spread across 408 village Panchayats, 14 blocks (Panchayat union), and 8 taluks. A broad profile with the available information is attempted with the help of secondary information. Notwithstanding the reliability of the available secondary information, mainly the distributive aspects of rural water supply are analyzed.

1.4.3 Primary household survey period

The primary household survey was conducted with the help of a detailed interview schedule (Annexure II) during first May 2000 to end of October 2000. The survey period covered summer and rainy seasons as well. In addition, the National Sample Survey Organisation (NSSO) 54th round 1999 data on rural water supply in India for analysis.
1.4.4 Tools of Analysis

Simple statistical tools* such as t’ test, regression model and ANOVA for testing of hypotheses, mean, standard deviation and co-efficient of variation are used along with bar and pie diagrammes. Regression model is used to analyze both secondary and primary sources of information. The Ordinary Least Squares (OLS) method is followed with linear formations for estimating the values. In terms of explanatory power the linear formulations are more suitable. For the preliminary analysis, a large number of variables are included, however only five to six variables were used for the actual analysis. The correlation matrices are used to drop less important variables and thereby avoid multi-colleniarity problems. For the final regression analysis number of different combinations are tried to arrive at a final list of variables with a good fit in terms of explanatory power. Block rate pricing method is used to estimate the tariff rates for pipe service connections with the help of the actual village level data.

In sum, the actual data analysis of both secondary and primary information has been carried out at different levels, presented in third, fourth and fifth chapters of the present study. First, the NSSO data were analysed with a hypothesis testing using paired ‘t’ test. Secondly the TWAD Board re-survey data were analysed with a regression model. Thirdly, primary household survey information was analysed through regression equation and Duncan test to test the stated hypothesis. And finally Block rate pricing method was applied to estimate the rural water tariff for house service connections.

1.5. Chapter Schemes

The chapter scheme of the study is in order. Introductory part, statement of the problem, objectives and methodology are the major components of the First chapter. Second chapter sets out the conceptualization of the problem and review of literature. National and State scenarios form part of the Third chapter. The Fourth chapter includes the profile of the study district and discusses the analysis of rural

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* The software, Statistical package for Social Sciences (SPSS) is used to carry out the calculations.
water supply at the habitation level of the entire district. Fifth chapter presents the results of the household survey and the environmental dimensions of rural water supply. Findings, policy implications, summary and conclusion formed the last chapter.