

Urban water management network of household expectations

M.G. Akpinar^a, M. Gul^{b,*}, R.F. Ceylan^a

^aAkdeniz University, Faculty of Agriculture, Department of Agricultural Economics, 07070 Antalya, Turkey, Tel. +90242 310 6554, email: mgoksel@akdeniz.edu.tr (M.G. Akpinar), figenceylan@akdeniz.edu.tr (R.F. Ceylan)

^bSuleyman Demirel University, Faculty of Agriculture, Department of Agricultural Economics, 32260, Isparta, Turkey, Tel. +90246 2118588, email: mevlutgul@sdu.edu.tr

Received 12 July 2016; Accepted 9 January 2017

ABSTRACT

Access to clean potable water is a global issue while it is also one of the articles of human rights. The demand for water increases as the population rises and economic activities grow. However, the water pollution and declination in water levels in the dams due to global warming as well as the low quality of potable water brings up the issue of running water sufficiency and safety. This study measures consumer satisfaction level and expectations on potable city water quality and services based on the cross-sectional data collected from urban settings in the Mediterranean region of Turkey. The results suggest that 71.4% of households use city water as their potable water and define the quality of potable city water as average quality. While the survey findings indicate that the colour and turbidity qualities of accessed water were ranked quite high, conductivity, taste and odour of the water have received lower rankings of satisfaction within a five Likert-scale. Additionally, lack of pre-information on water cuts, insufficient maintenance and repair services and unsatisfactory responses to the consumer complaints were listed as the main problems encountered in city water services. Besides, quality improvement of potable water, water pricing and safety issues were found as the most important items.

Keywords: Expectations; Tap water; Management; Turkey

1. Introduction

Water is the basic source of all life. Water is needed for human usage, for ecosystem usage, for economic development, for energy generation and for national security. Besides, water is one of the most important resources for sustainable development. Due to rapidly increasing water demand in the world, economical, political and environmental campaigns have gained important dimensions. Apparently, as global water crisis starts to be visible, water resources encounter significant problems in terms of quantity, quality and sectorial usage [1].

World water market has been progressing under four mega trends. Firstly, the water demand rises due to global

population growth. Secondly, increasing investment on potable and waste water facilities is apparent. Third trend is the demand for higher standards in water quality and the last is the water crisis in some regions due to climatic changes. Most important demographic changes affecting the world water use are the rise in urban population and increase in overall life standards. These two changes interact in a way that as life standards and needs associated increase, the water demand rises more than the global population growth. In fact, while annual water use per capita was 580 m³ in 1950, it has risen to 625 m³ in 2000. Number of cities with population more than 1 million was 86 in 1950 while this number has increased to 387 in 2000. Similarly, number of megacities where more than 6 million people live has reached to 100 in 2000. While 29 % of world population was living in urban areas in 1950, this ratio has risen to 50% in 2000. According to the United Nations,

*Corresponding author.

Presented at the 3rd International Congress on Water, Waste and Energy Management, Rome, Italy, 18–20 July 2016

60% of the world population will be living in urban areas in the year of 2030 [2]. Given these demographic information, the significance of urban water management is expected to increase in the following years.

Access to clean potable water is a basic issue on a global level, while it is also one of the articles of human rights. Potable water is defined as the water provided by an institution or an entity for purposes of human consumption, preparing beverages and food as well as cleaning the stuff used to prepare food and beverages [3]. Personal and household consumption constitutes 15% of total water consumption, while only 3% is for potable water. The production and distribution services of potable water are mainly maintained by city municipalities, while it might differ from one country to another.

The production and distribution services of potable water are mainly maintained by city municipalities in Turkey. In accordance with the law no. 2560 “Central operation authority of intraregional waters”, municipalities are in the position of natural monopolies, as they operate the available source and underground water and distribute water among consumption groups. In other words, municipalities represent the whole industry in Turkey in terms of water production and distribution and have no significant other. Total water demand constitutes of low-end market demand such as households, commercial and industrial workplaces and public sector as mentioned by Deliktaş [4].

Studies regarding potable water gains more importance in an environment where water supply and demand management is maintained in the spotlight of water safety and security. The rising tendency of the population, reducing water level in dams due to global warming, rising water pollution and reduction in potable water quality revive the problem of sufficiency and safety in city water supplies all over the world. Water supply and demand management develops around the sufficient and safe water supply-use and in this parabola productivity and optimization provider administrative searches in city water services gain importance.

When previous studies are examined on international level, it can be seen that water market was centered upon in most of the countries. In a study conducted by Matraves [5] in the European Union and especially in four developed members of the union (the UK from a former perspective, Germany, France and Italy), competition differences on bottled potable water and fizzy drink markets were examined with respect to marketing mix changes. The study indicated that mineral water market has been restricted in these markets due to the requirements of bottling in the source and soft drinks market has been accelerated in the integration process. In the study of Deliktaş [4] domestic water demand modelling was made and water demand price elasticity was calculated as 0.560 and income elasticity of water demand was calculated as 0.069. In addition to these, it was pointed out that by applying different pricing and marketing policies for trimesters, more efficient producer and consumer satisfaction can be achieved.

Persson [6] researched the urban household choices on potable water resources in Philippines. Study was conducted in Cebu, one of the largest cities of Philippines and the effects of price, taste, size of household on choice possibilities were dwelled upon. Study states that the most important determinant on household potable water resource preferences was the time cost. In a study conducted by Çelik [7] with over 800 people in Antalya, Turkey, pub-

lic’s opinions and possible solution suggestions on potable water quality problems were surveyed. Study remarks on the insecurity about city water in terms of health. In the study conducted by Bontems and Nauges [8], environmental, quality related and demographic factors affecting the city water non-consumption preferences of 4.758 French consumers were examined with Probit modelling. While 68% of survey participants were classified as tap water drinkers, the main non-drinking reasons were noted as bad taste, its calcium content leading to hardness and sanitary concerns. However, higher price of bottled water has been found as a motivating factor for poorer consumers.

In a survey study about healthy potable water conducted with 2000 households by Eren et al. [9] households’ willingness to pay for healthy, quality potable water were examined. It was understood that there is a negative correlation with number of households and willingness to pay for potable water, while there appeared a positive correlation with number of income generating household members. It can also be concluded household head’s rise of in income and education levels, leads to more willingness to consume potable water. This also remarks the relationship between levels of income and education and health consciousness.

In accordance with these evaluations, this study aims to measure consumer satisfaction level and expectations regarding potable city water quality and services based on the cross-sectional data collected from urban settings in urban Turkey.

2. Material and method

In addition to secondary data and previous studies, primary data retrieved from the Mediterranean region of Turkey was used for analysis. Sufficient sample size for the field was stated as 965 with respect to sampling calculations [10]. The details of the sample is such that 322 households in Adana, 322 households in Antalya and 321 households in Hatay were interviewed through face-to face survey. In marketing researches, specific confidence limit and statistical variation for different population sizes and toleration levels were assumed and different sample sizes were used. The reference sampling system was demonstrated in Table 1.

Table1
Sample Size for Different Population Sizes Within 95% Confident Limits

Population Sizes	±1 %	±2 %	±3 %	±5 %
1.000	-	-	437	244
2.000	-	-	619	278
3.000	-	1206	690	291
4.000	-	1341	732	299
5.000	-	1437	760	303
10.000	4465	1678	823	313
20.000	5749	1832	858	318
50.000	6946	1939	881	321
100.000	7465	1977	888	321
500.000 and more	7939	2009	895	322

After sample size was determined, frame list consisting of total neighbourhood numbers and populations of Antalya, Adana and Hatay city centres was created; sample size determined for every city was distributed proportionally between neighbourhoods considering the population according to the frame list. Selection from the reference population of households was carried out with random sampling.

In consumer theory, it's assumed that consumers make rational choices for utility-maximization. Rational choices were made according to efficient needs. However, benefits have functional (gaining made from consumption), sensorial (colour, shape, comfort), self-descriptive (brand loyalty) sides as well [11]. Likert scale from 'very bad' to 'very good' was used in consumer evaluations of city water quality and services in the study for target provinces [12]. Analysis and evaluation of consumer data was made with SPSS statistical package. Simple descriptive statistics were used in presentation of the data.

3. Results and discussion

3.1. Consumer profile

Factors effecting consumption and consumer behaviour were examined by economic, social and psychological variables. Market types change according to consumer units and the market structure, where goods and services were purchased for the purpose of end-use or consumption can be defined as the consumer market. Therefore, the factors affecting consumption and purchasing behaviour form an important focus of marketing research. In this direction, interviewed consumer sample was examined with reference to demographic variables firstly and the findings were presented in Table 2. 53.3% of the interviewed consumers were women and 46.7% of them were men. In terms of age distribution, 48.8% of participants represent the young population, 41.3% represent working population and 8.9% represent the old population. The education distribution of the group is centered on middle-high school graduates with 41.5% and people with people with graduate and post graduate degrees with 42.4%. Therefore, it can be seen that urban life brings up an increase in the average education period with itself. In addition, most of the participants are married with 67.6% while 28.4% are single and 4.0% are either divorced or widow.

Table 2
Profile of Consumers

Gender	Male	Female			
	46.7 %	53.3 %			
Age	18-34	35-54	55+		
	48.8 %	41.3 %	8.9 %		
Education	Literate	Elementary	Middle-High	University +	
	2.0 %	14.1 %	41.5 %	42.4 %	
Marital Status	Single	Married	Divorced	Widow	
	28.4 %	67.6 %	4.0 %		
Household Size	1 person	2 people	3 people	4 people	5+ people
	6.2 %	18.3 %	26.3 %	27.5 %	21.7 %

Average household size for urban areas was estimated as 3.51 people, which is in conformity with the modern family size expectations. Elementary family model consisting of mother, father and one or two children becomes widespread in the urban life through the economic growth and development process of Turkey as well. With-no-doubt, demographic variables examined here were expected to create a difference on city water (running water) quality perceptions and consumer expectations.

3.2. Quality perceptions of city (tap) water and satisfaction level

Total product quality evaluation includes subjective and objective quality features of tap water. Objective product quality was about qualitative features of the product. On the other hand, subjective quality consists of variables about abstract and concrete elements (colour, shape, design, taste, image etc.) of the product. Consumer perceptions for product or service means subjective quality evaluation mainly and quality perceptions for urban city water were examined in the study.

City water should conform to TS 266 certificate of standard in Turkey. Evaluations of households on some features stated under these standards were presented in Table 3. As it can be seen in the table, quality of city water was evaluated as medium-level. While colour and turbidity criterions of water were graded relatively high, satisfaction level in terms of conductivity, taste and smell was lower. 20% of households have stated the quality of city water as 'bad'

Table 3
Evaluation on Quality Features of City (tap) Water

Variables	Average*	Standard Deviation	Total N
Taste	3.14	1.005	965
Colour	3.47	0.843	965
Smell	3.35	0.936	965
Turbidity	3.42	0.896	965
Conductivity (hardness-softness)	3.11	1.004	965
Total water quality	3.21	0.926	965

*5-level Likert Scale

and this percentage is relatively high. Indeed, ratio of participants who think the quality of city water is ‘very good’ is only 9%. Generated conclusion from this information is that the total quality of city water should be improved in order to gain more acceptance from the urban citizens.

Under the scope of the study, households’ considerations on city water services were also considered (Table 4). Accordingly, likewise the city water quality, overall satisfaction level on municipality water services and safety of water was moderate. On the other hand, prices were found a little high with a score of 2.61 out of 5. However, satisfaction on water permanency and water duress was relatively high. Households’ general satisfaction level on city water services was determined as 65.2% with 3.26 average points, in the light of obtained findings.

Consecutively, opinions of households on problems of city water were presented in Table 5. According to this, the mostly encountered problems were related to physical conditions of the water after water cuts. The observations and complaints are based on water ‘being brown for a while’, ‘having a thin whitish layer due to chlorination’ and ‘having a bad taste’ after water cuts. Browning problem after water cut can be related to aging waterworks infrastructure of residence building along with city water infrastructure, yet is attributed to water provision services mostly.

Evaluations of households on city water services were presented in Table 6 and encountered problems were presented in Table 7 consecutively. Accordingly, 26.3% of interviewed households have stated that they have never encountered a problem about water services. In spite of

this claim, 73.7% of them have expressed their complaints about the water services. The most important problems encountered on water services concentrates on water cuts happening on a moment’s notice without pre-information (66%), untimely maintenance and repairing services (30.2%), not getting returns on their complaints about water and related services (23.9%), frequency of water cuts (12.9%) and malfunctions on cutting and opening services of water (12%).

The fact that the field study of the research was conducted in the summer term is a reason behind the tendency to declare and focus more on the problems. Water supplier institutions of the urban city centres mainly in the Mediterranean region should pay more attention to mentioned subjects in terms of household satisfaction as the summer temperatures are considerably high in the region.

3.3. Household expectation on city (tap) water services

Consumer tendencies and expectations are important specifically for the products or services open for permanent use. Because improvement of those products or services are closely related with the satisfaction levels. In urban areas, especially in crowded cities a consumption shift from city water to packaged water is being observed as a general trend. City water quality plays a determinant role in this tendency towards packaged water. Also, activity level of city water services in residential area is effective on consumer attitude and acts. Inefficacies about access to qualified and safe water

Table 4
Evaluation of City (tap) Water in Terms of Various Criteria

Criteria	Average*	Standard Deviation	Total N
Water amount (water duress)	3.68	0.902	965
Water permanency	3.73	0.936	965
Water price	2.61	1.098	965
Water safety	3.09	0.936	965
Municipality services regarding water	3.20	0.975	965
Satisfaction level	3.26	0.923	965

*5-level Likert Scale

Table 5
Problems Related to City (tap) Water

Problems	Never	Sometimes	Always	Total
Smell of water	50.3	43.9	5.8	100.0
Water being blurry	45.3	50.5	4.2	100.0
Water consisting silt	60.2	34.7	5.1	100.0
Thin whitish layer due to chlorination	32.6	52.7	14.6	100.0
Water having a bad taste	46.5	41.7	11.8	100.0
Browning of water after water cut	40.5	44.2	15.2	100.0

Table 6
Evaluations on City (tap) Water Services

	Frequency	%
The ones who stated that there’s no problem	254	26.3
The ones who thinks that there are problems	711	73.7
Total	965	100.0

Table 7
Problems Encountered in City Water Services

	Frequency	%
Water cuts happening on a moment’s notice	637	66.0
Water bills coming late	87	9.0
Water bills not coming	36	3.7
Not getting an answer on their complaint about water	231	23.9
Malfunctions on cut and open services of water	116	12.0
Frequency of water cuts	124	12.9
Maintenance and repair not being done timely	291	30.2
Other	68	7.0

*Consumers have stated two primary problems

Table 8
Improvement-Expected Subjects in City (tap) Water

	Frequency	%
Water quality	584	60.5
Water duress	62	6.4
Water price	293	30.4
Water safety	455	47.2
Price payment system	46	4.8
Service quality	110	11.4
Network maintenance	114	11.8
Water durability	249	25.8

*Distribution according to total survey number (n/N = 965)

gain currency. In this respect, issues households want to be improved in the future were scrutinized (Table 8). According to consumer findings, subjects of water quality (60.5%), water safety (47.2%), water price (30.4%) and water durability (25.8%) were regarded as issues that should be focused on city water management. As it can be seen in the results, consumers are aware of water being scarce due to their concerns about city water quality, safety and endurance. In this respect, institutions related to water services should concentrate on these issues for overcoming future concerns on water adequacy and quality.

4. Conclusions

City water services is a significant issue on public and social levels. While setting the strategies and policies in order to enhance the production and distribution services of water, the demand and expectations of target consumers are to be considered as well. Thus, developing services catering for the expectations of the consumers shall also allow efficient use of scarce resources. The results of the study indicate that water quality and safety in potable city water production and distribution services are the primary development areas for the target regions. In a situation where a 100% consumer satisfaction is not considered possible, a satisfaction level around 90% should provide utility maximization both for producer and consumer. Therefore, problems encountered in city water services should be taken into consideration. Besides, having environmental considerations regarding bottled water is and should divert authorities to both safety and quality of tap water. In case the quality and sanitary considerations of the households reduce regarding tap water, it might be a possibility to reduce bottled water consumption.

In addition to being used as drinking water, potable water is essential for home use such as cleaning purposes. In this case, communal timely information systems about water cuts, timing of maintenance and repair services can be stated as resolvable areas with supervisory approaches which also are expected to contribute in water safety. Water quality, safety and sufficiency issues are related to infrastructure facilities thus are considered to be more costly and more long dated. If improvement services are held in a timely and efficient direction, consumers' willingness to

pay more for good quality potable water will be considered as additional financial source for additional services.

When compared with the previous studies, the sanitary concerns and reactions regarding taste and perceptions of drinking water are the factors distracting consumers from tap water consumption with respect to the current findings [8]. In addition to having sampling similarities, the study also confirmed the results of Çelik's study conducted in Antalya. In both studies, the insecurity of water pipe systems and sanitary considerations are the main drivers of potable water use [7]. Besides, having reached a sample with relatively higher education level, resulted in moderate evaluation of importance of price in tap water-potable water dilemma as Eren and his friends' study [9]. This findings also coincide with results of two surveys of conducted in Pakistan. The study showed that willingness to pay for safe, high quality water rises with the rise of education level in Hyderabad, Pakistan [13], while it was understood that the consumers accept higher service prices for better water supply services in Abbottabad, Pakistan [14].

It was also confirmed in a historical review of bottled water consumption in the UK that, people prefer to use bottled water as they are not satisfied with the tap water quality. This means that, bottled water is a new born concept after 1980s that turned into want [15]. This is also a similar reference with our current study. Alike with many studies, socio-economic differences matter in consumption preferences of drinking water. One other example is from Tunisia, which emphasized the importance of education and income in changing the consumption patterns [16].

Additionally, in areas where water quantity is not sufficient enough, improvement of water quality is not observed as the primary concern. As there are differences in potable water potential geographically, variations between regions in terms of infrastructure and development level are expected to shape society's expectations about potable water services.

Acknowledgements

We would like to express our thanks to TÜBİTAK (The Scientific and Technological Research Council of Turkey) (Project number: 108K616) for their financial support.

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