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Perception of Farmers towards Koramangala - Challagatta (K. C.) Valley Project in Kolar District of Karnataka

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Authors Contribution

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Abstract

The present investigation was undertaken in Kolar district of Karnataka state during 2021-22 to analyse the farmer's perception about the Koramangala-Challaghatta Valley project (K.C. Valley Project), which is deemed to be a unique project in the country. It's a rare irrigation project and first of its kind in the country. Under this project, treated sewage water is used to fill irrigation tanks in Kolar and Chikkaballapura districts. Data was collected personally by the researcher through pretested interview schedule from 180 respondents. It was found that 40.00 per cent of marginal farmers belonged to better perception category followed by average (38.33%) and good (21.67%) perception category respectively. More than half of the small farmers (55.00%) belonged to average perception category followed by good (31.67%) and better perception (13.33%). Nearly two third of the big farmers (63.33%) belonged to good perception category followed by better (26.67 %) and average perception (10.00 %) category respectively. Relative importance index of perception as expressed by farmers is mentioned in this paper.

Keywords : K. C.Valley project, Perception, Treated water

The sustenance of life depends on the natural resources. Burgeoning growth in population exerting tremendous pressure on the land and other water resources. Due to rapid industrialization, the effluents are discharging into the lakes and water bodies. In most of the metropolitan cities it is a common phenomenon. Due to lack of drainage system, sometimes water will over flows and stagnates in puddles. Today, an estimated 80.00 per cent of global wastewater is being discharged untreated into the world's waterways (Anonymous, 2017). This affects the biological diversity of aquatic ecosystems and disrupts the fundamental web of our life support systems, on which a wide range of sectors from urban development to food production and industry depend.

In India, our capacity to treat sewage water is low as there is a low underground sewerage to transport wastewater and low number of Sewage Treatment Plants (STPs). Only two per cent towns in the country have both these facilities. Overall, there is capacity to treat only about 37 per cent of the 62 billion litres of sewage water generated daily by urban India. Currently, Bangalore generates 1400 Million Liters waste water per day (MLD), as per Bangalore Water Supply and Sewerage Board conservative estimates. The city has total treatment capacity of 721 MLD, but only 520 MLD gets treated on an average.

Globally, area under groundwater irrigation is highest in India (38 million ha) followed by China (19 million ha) and USA (17 million ha). In Karnataka, total replineshable groundwater potential for the state is estimated at 17.03 Billion Cubic Meters (BCM) received from both monsoon and non-monsoon seasons rainfall constitutes 9.48 BCM and recharge

of 7.55 BCM from other sources (Krishna Raj and Chandrakanth, 2015). Kolar district has 26,144 hectares gross irrigated area, of which 17,135 (10.22%) hectares was net irrigated and remaining area was rainfed. Total number of wells in the district were 29,936 and ground water availability with the depth of 1,150 feet. Major irrigation sources include wells, bore wells and ponds etc. during the year 2012. The Central Ground Water Board (CGWB) assessment team reported about the groundwater situation of Kolar district. During 2016, the Kolar district falls in over exploited category across all blocks. There is a possibility to improve area under irrigation by augmenting groundwater recharge in all taluks as these blocks have exceeded the safer limits and fall in over-exploited category (Anonymous, 2020).

Considering the significance of waste water on production and productivity of agriculture and to meet the escalated demand for water, Karnataka Government's ambitious project of supplying treated water from Bengaluru to the arid districts came into existence during 2016 as Koramangala - Challagatta (K.C.) valley project aimed at increasing the groundwater table in Kolar district. Kolar is a drought prone area and ground water level is depleting over the years. A farmer used to spend up to Rs.5 lakh to sink a borewell with the hope of finding water. Often, the water used to dry up very soon and he would be left with a huge debt to repay. This K.C. Valley needs to be emulated across the Kolar to solve the problem of dry borewells and poor groundwater level. In K.C. Valley project, Bangalore sewage treated water is supplying to Kolar district. In this regard, it is essential to analyze the farmer's perception, acceptance and any religious barriers in utilization of sewage treated water for domestic as well as irrigation purpose. The present paper has been conceptualized with the objective of measuring perception of farmers towards K.C. Valley project.

Perception

According to Ray (1991), perception is an activity through which an individual becomes aware of objects around him and of events taking place. He considers perception as selective and we perceive what we want to perceive. Individual differs in perceiving the things and it is crucial to study the perception of people when a new project is implemented. Researcher operationally defined the Perception as 'process of awareness, comprehension or understanding and interpretation of KC valley project by the farmers'.

Methodology

The present study was purposively carried out in Kolar district of Karnataka State. Kolar and Srinivaspura taluks were selected purposively for the study as the numbers of tanks filled were more in these two taluks. The ex-post facto research design was used. Random sampling method was employed for the selection of respondents. The primary data were collected from 180 farm households, consisting of 90 farm households in Kolar taluk and 90 from Srinivaspura taluk. From each taluk, 30 marginal, 30 small and 30 big farmers were selected. The data were collected from the respondents through personal interview method using pre-tested and well-structured schedules. The responses were scored, classified, analyzed to calculate the mean score, Standard deviation and Relative importance Index using Microsoft excel -2019 and Kruskal-Wallis H test using SPSS.

Relative Importance Index

Relative Importance Index is calculated for each of the indicators of perception and ranked accordingly.

The RII derived to summarize the importance of each indicator:

$$RII = \frac{\sum W}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

Where,

W = weighting as assigned on Likert's scale by each respondent in a range from 1 to 5, where 1=Strongly disagree, 2=Disagree, 3=Undecided, 4=Agree and 5=Strongly Agree.

A = Highest weight (here it is 5)

N = Total number in the sample.

Kruskal - Wallis H test

The Kruskal - Wallis H test is a non-parametric one-way ANOVA on ranks used for testing whether samples originate from the same distribution. It was used in the study for comparing more than two independent samples of equal or different sample sizes.

Results and Discussion

Overall Perception of Farmers towards K.C. Valley Project

The data presented in the Table 1 depicts the overall perception of farmers towards K. C. Valley project. It is evident that two fifth of marginal farmers (40.00 %) belonged to better perception category followed by average (38.33%) and good (21.67%) perception category. Majority of the marginal famers had better to good perception. The probable reason is that, farmers might have availed irrigation facilities all round the year due to implementation of K.C. Valley project which enabled them to practice different cropping system, that resulted in securing better returns. The results are in line with the findings of Rajvendra and Kinjulck (2012).

It is clear from the Table 1, that more than half of the small farmers (55.00%) belonged to average perception category followed by good (31.67%) and better (13.33%) perception. More than three fifth of the big farmers (63.33%) belonged to good perception category followed by better (26.67 %) and average (10.00 %) perception category. The results are in conformity with the Younus (2013).

Majority of the small and big farmers had average to good perception; the probable reason for average and good perception may be that small and big farmers were not satisfied with the water quality. Further, they were more cosmopolite and educated, had knowledge regarding the importance of water quality, effects in agriculture. Majority of them also expressed their views during interview that because of the increase in water availability, marginal farmers and labourers working in their field are also started cultivating crops all-round the year and competing with small and big farmers. Further, In addition to this, they expressed that due to increased supply of produce they are not getting better prices for the produce in the market. This may be the reason for having average to good perception.

Overall, it is apparent from the table that almost equal number of farmers spread over into better (36.11%), good (32.22%) and average perception (36.11%) categories. The results are in line with Gopika and Lalitha (2018).

The farmers in the K.C. Valley region are having both positive as well as negative perception towards the project in their own way with so many benefits as well as lacunas. Hence, farmers were distributed over different perception categories.

Table 1

Overall perception of farmers towards K.C. valley project

Categories	Marginal farmers (n_1= 60)		Small farmers (n_2 = 60)		Big farmers (n_3 = 60)		Total No. of farmers (n = 180)	
	No	%	No	%	No	%	No	%
Average (< 67.11)	23	38.33	33	55.00	6	10.00	57	31.67
Good (67.11 - 83.99)	13	21.67	19	31.67	38	63.33	58	32.22
Better (> 83.99)	24	40.00	8	13.33	16	26.67	65	36.11

Mean = 75.55 ; SD = 16.87

Statement Wise Perception of Farmers towards K.C. Valley Project based on Relative Importance Index

Marginal Farmer's Perception towards K. C. Valley Project based on Relative Importance Index

The data presented in Table 2 indicates that, marginal farmers strongly perceived the statement K.C. Valley project helped in increasing ground water table as relatively important (Rank I) followed by treated water reduces the demand and stress on fresh water supply (Rank II), treated water is harmful for consumption (Rank III), treated water will be an alternative to fresh water irrigation sources (Rank IV), cropping pattern has been changed after increased availability of ground water (Rank V), increasing in livestock farming by cultivation of more pasture through treated water (Rank VI) and treated water smells and it is unhygienic (Rank VII).

Marginal farmers expressed the following statement as moderately important: groundwater contamination after implementation of project (Rank VIII), cropping intensity has been increased after the implementation of K.C. Valley project (Rank IX) followed by use of treated water can leads to lower production cost and is economical (Rank X). The statement irrigation with waste water allows you to produce high value crops (Rank XI), income has been increased after the implementation of project (Rank XII), use of treated water will affect the health of the farmers and animals (Rank XIII) and the statement project helps in effective utilization of waste water (Rank XIV).

Relatively least important statements as perceived by marginal farmers were irrigation with treated water will act as insurance against drought and seasonal variability (Rank XV), willing to pay for the waste water (Rank XVI), treated water increases the nutrient availability to the crop (Rank XVII), Increase in ground water availability will increase the agricultural production as well as productivity (Rank XVIII) followed by the statement sewage treated water helps in increasing the speed of growth of crop (Rank XIX) and trust in the technology for making water safe for reuse (Rank XX).

The statement K.C. Valley project helped in increasing ground water table treated water reduces the demand and stress on fresh water supply was perceived as relatively important. Probable reason might be that treated water supply in Kolar region has enhanced the ground water recharge through deep percolation, water table has been increased and farmers are getting water at lowest feet as well. Treated water is used by the farmers for domestic as well as agricultural purposes. So by utilization of freely available water for irrigation as well as consumption, it is acting as an alternative source for fresh water.

Small Farmer's Perception towards K.C. Valley Project based on Relative Importance Index

The data presented in the Table 2 elicit the relative importance of small farmer's perception towards K.C. Valley project. Relatively most important statements as expressed by small farmers were K.C. Valley project helped in increasing ground water table (Rank I), treated water is harmful for consumption (Rank II), treated water reduces the demand and stress on fresh water supply (Rank III), treated water smells and it is unhygienic (Rank IV) followed by the statement cropping pattern has been changed after increase in groundwater table and cropping intensity has been increased after the implementation of K.C. Valley project (Rank V), project helps in effective utilization of waste water (Rank VII).

Moderately important statements as expressed by small farmers are increasing in livestock farming by cultivation of more pasture through treated water (Rank VIII), waste water will be an alternative to fresh water irrigation sources (Rank IX) groundwater contamination after implementation of project (Rank X). The statement treated water increases the nutrient availability to the crop (Rank XI), willing to pay for treated waste water and improved drainage facilities as (Rank XII), the use of treated water will affect the health of the farmers and animals (Rank XIII) use of treated water can leads to lower production cost and is economical

TABLE 2

Statement wise perception of farmers towards K.C. valley project based on relative importance index

(n=180)

Statements	Marginal farmers (n_1 = 60)		Small farmers (n_2 = 60)		Big farmers (n_3 = 60)	
	RII	Rank	RII	Rank	RII	Rank
Do you perceive treated water is harmful for consumption	0.790	III	0.847	II	0.793	XII
Do you perceive treated water smells and it is unhygienic	0.750	VII	0.793	IV	0.840	VII
Do you perceive, the use of treated water will affect the health of the farmers and animals	0.681	XIII	0.690	XIII	0.797	XI
K.C. valley project helped in increasing ground water table	0.950	I	0.977	I	0.970	I
Do you find groundwater contamination after implementation of project	0.713	VIII	0.720	X	0.677	XIX
Increase in ground water availability will increase the agricultural production as well as productivity	0.623	XVIII	0.617	XVII	0.690	XVIII
Do you have trust in the technology for making water safe for reuse	0.417	XX	0.460	XIX	0.397	XX
Irrigation with waste water allows you to produce high value crops	0.688	XI	0.663	XV	0.729	XVI
Do you perceive that project helps in effective utilization of waste water	0.680	XIV	0.763	VII	0.847	VI
Do you perceive that because of increase in ground water availability cropping pattern has been changed	0.780	V	0.767	V	0.863	V
Cropping intensity has been increased after the implementation of K.C. valley project	0.710	IX	0.767	V	0.877	III
Do you perceive that treated water reduces the demand and stress on fresh water supply	0.793	II	0.810	III	0.747	XIV
Do you perceive that treated water increases the nutrient availability to the crop	0.647	XVII	0.700	XI	0.900	II
Do you perceive that use of treated water can leads to lower production cost and is economical	0.703	X	0.680	XIV	0.757	XIII
Irrigation with treated water will act as insurance against drought and seasonal variability	0.677	XV	0.653	XVI	0.873	IV
Is there is increasing in livestock farming by cultivation of more pasture through treated water	0.751	VI	0.760	VIII	0.813	X
Sewage treated water helps in increasing the speed of growth of crop	0.540	XIX	0.280	XX	0.737	XV
Do you perceive, waste water will be an alternative to fresh water irrigation sources	0.783	IV	0.747	IX	0.823	IX
Are you willing to pay for treated waste water and improved drainage facilities	0.670	XVI	0.693	XII	0.830	VIII
Do you perceive that your income has been increased after the implementation of project	0.683	XII	0.590	XVIII	0.720	XVII

(Rank XIV), irrigation with waste water allows you to produce high value crops (Rank XV).

Small farmers perceived the following statements as relatively least important. The statement irrigation with treated water will act as insurance against drought and seasonal variability (Rank XVI), Increase in ground water availability will increase the agricultural production as well as productivity (Rank XVII), income has been increased after the implementation of project (Rank XVIII), trust in the technology for making water safe for reuse (Rank XIX) followed by sewage treated water helps in increasing the speed of growth of (Rank XX).

The statement K.C. Valley project helped in increasing ground water table treated water is harmful for consumption is perceived as relatively important. The probable reason treated water may remove contaminants but leave behind some of the by products, when they enter in the distribution system they might to harmful for consumption. Farmers expressed the statement sewage treated water helps in increasing the speed of growth of crop as least. Irrigation with treated water has proven beneficial effects on plant health and soil quality in countries having low water resources such as Middle East, United Arab emirates, Israel, Kuwait, Malta, Qatar and Saudi Arabia (Hashem and Xuebin, 2021). Lack of knowledge regarding these beneficial effects of using water may be the probable reason for this.

Big Farmer's Perception towards K.C. Valley Project based on Relative Importance Index

The data presented in Table 2, throws the light on the Relative importance of big farmer's perception towards K.C. Valley Project. Big farmers perceive the following statements as relatively important. The statement K.C. Valley project helped in increasing ground water table (Rank I) treated water increases the nutrient availability to the crop (Rank II), cropping intensity has been increased after the implementation of K.C. Valley project (Rank III), irrigation with treated water will act as insurance against drought and seasonal variability Rank (IV), cropping pattern has been changed due to increase in ground water availability (Rank V). The project helps in effective utilization of waste water (Rank VI)

Moderately important statement as perceived by big farmers are sewage treated water smells and it is unhygienic (Rank VII), willing to pay for treated waste water and improved drainage facilities (Rank VIII), waste water will be an alternative to fresh water irrigation sources (Rank IX) and increasing in livestock farming by cultivation of more pasture through treated water (Rank X). The statement the use of treated water will affect the health of the farmers and animals (Rank XI), treated water is harmful for consumption (Rank XII) treated water can leads to lower production cost and is economical (Rank XIII), treated water reduces the demand and stress on fresh water supply (Rank IV), Sewage treated water helps in increasing the speed of growth of crop (Rank XV).

The statement irrigation with waste water allows you to produce high value crops (Rank XVI), income has been increased after the implementation of project (Rank XVII), ground water availability will increase the agricultural production as well as productivity (Rank XVIII) followed by groundwater contamination after implementation of project (XIX) and trust in the technology for making water safe for reuse (Rank XX).

The statement K.C. Valley project helped in increasing ground water table as highly important and ranked first important. Kolar district ground water table is plummeted below ground level over past few years. The supply of K.C. Valley water has helped in increasing the water table as well as water availability. The statement groundwater contamination after implementation of project and trust in the technology for making water safe for reuse is perceived as least important by farmers. The probable reason might be in long range the soil quality and water quality may deteriorate by accumulation of impurities if water is not treated properly and farmers lacks knowledge and awareness about the water treatment process as well as treatment plant.

Statement wise Overall Farmers Perception towards K.C. Valley Project based on Relative Importance Index

The data presented in Table 3, depicts the relative importance of farmers perception towards K.C. Valley project. Relatively most important statements as expressed by overall farmers are K.C. Valley project helped in increasing ground water (Rank I), treated water is harmful for consumption (Rank II), treated water smells and it is unhygienic (Rank III), the use of treated water will affect the health of the farmers and animals (Rank IV) followed by increase in livestock farming by cultivation of more pasture through treated water (Rank V). The statement treated water reduces the demand and stress on fresh water supply (Rank VI), cropping intensity has been increased after the implementation of K.C. Valley project (Rank VII).

Moderately important statements as expressed by overall farmers are project helps in effective utilization of waste water (VIII), cropping pattern has been changed due to increase in groundwater availability (Rank IX), irrigation with treated water will act as insurance against drought and seasonal variability (Rank X), treated water increases the nutrient availability to the crop ranked (Rank XI), willing to pay for treated waste water and improved drainage facilities (Rank XII), treated water can leads to lower production cost and is economical (XIII), waste water will be an alternative to fresh

TABLE 3

Statement wise overallfarmersperception towards K. C. valley project based on relative importance index

(n=180)

Statements	RII	Rank
Do you think treated water is harmful for consumption	0.810	II
Do you think treated water smells and it is unhygienic	0.799	III
Do you think, the use of treated water will affect the health of the farmers and animals	0.794	IV
KC valley project helped in increasing ground water table	0.824	I
Do you find groundwater contamination after implementation of project	0.724	XV
Increase in ground water availability will increase the agricultural production as well as productivity	0.666	XVIII
Do you have trust in the technology for making water safe for reuse	0.391	XX
Irrigation with waste water allows you to produce high value crops	0.714	XVI
Do you think, project helps in effective utilization of waste water	0.757	VIII
Do you think , because of increase in ground water availability cropping pattern has been changed	0.750	IX
Cropping intensity has been increased after the implementation of KC valley project	0.763	VII
Do you think, treated water reduces the demand and stress on fresh water supply	0.790	VI
Do you think , treated water increases the nutrient availability to the crop	0.747	XI
Do you think use of treated water can leads to lower production cost and is economical	0.743	XIII
Irrigation with treated water will act as insurance against drought and seasonal variability	0.749	X
Is there is increasing in livestock farming by cultivation of more pasture through treated water	0.791	V
Sewage treated water helps in increasing the speed of growth of crop	0.568	XIX
Do you think , waste water will be an alternative to fresh water irrigation sources	0.730	XIV
Are you willing to pay for treated waste water and improved drainage facilities	0.744	XII
Do you think, your income has been increased after the implementation of project	0.693	XVII

*RII- Relative Importance Index

water irrigation sources (Rank IV), groundwater contamination after implementation of project (Rank XV).

Relatively least important statement as expressed by overall farmers were waste water allows you to produce high value crops (Rank XVI), income has been increased after the implementation of project (Rank XVII), Increase in ground water availability will increase the agricultural production as well as productivity (Rank XVIII) and sewage treated water helps in increasing the speed of growth of crop (Rank XIX) and trust in the technology for making water safe for reuse (Rank XX).

The statement K.C. Valley project helped in increasing ground water table perceived as highly important by marginal, small and big farmers. The farmers in Kolar district were facing severe droughts and decline in groundwater table over the past few years. K.C. Valley becomes relevation to farmers in building confidence among them and K.C. Valley project has been implemented with the objective of groundwater recharge and it has successfully accomplishing the objective.

The statement trust in the technology for making water safe for reuseranked relatively least important by the farmers the probable reason may be that authorities might not create any awareness regarding the treatment process, frequent servicing needs to be done in treatment plant which may not be visible to farmers, farmers having limited knowledge on wastewater management.

Statement wise Perception of Farmers towards K.C. Valley Project

The data presented in the Table 4, indicates the statement wise perception of farmers towards K.C. Valley project. Table 4, portrays that more than three fourth (86.11%) of the farmers strongly agreed the statement K.C. Valley project helped in increasing ground water table. The farmers in Kolar district were facing severe droughts and decline in groundwater table over the past few years. K.C. Valley becomes relevation to farmers in building confidence among them. K.C. Valley project has been implemented with the objective of groundwater recharge and the purpose has been achieved. Hence, they opinioned that it helped in increasing the ground water table. The results are in conformity with the findings of Ramesh (2020).

The statement the use of treated water will affect the health of the farmers and animal was strongly agreed by 43.89 per cent of respondents. The probable reason might be that, during the interview farmers expressed that there was a occurrence of death of animals by direct consumption of water from the lake. So, farmers were afraid about that and if water is used for drinking purpose without filtering it might cause diarrhea and other health issues.

It is evident from the table that two-fifth (42.78%) of the respondents strongly agreed that cropping pattern has been changed due to increase in groundwater availability after the implementation of the project and agreed the statement cropping intensity has been increased after the implementation of K.C. Valley project (48.33%). The results of Pavithra and Gaddi (2022) also revealed that crop diversification in K.C. Valley region was comparatively higher compare to Non K.C. Valley region. After implementation of project, there is an increased water availability, which made farmers to cultivate more number of vegetable crops in K.C. Valley region. Thus, there was an increased cropping intensity in the project area irrespective of farmer's category. The respondents are cultivating vegetables in all the three agriculture seasons due to increased water table as well as water availability. Further, they adopted multiple cropping as well as sequential cropping in that region which could be the probable reason for the same. Apart from this, particularly marginal farmers started cultivating vegetables and flower crops instead of cereal crops because of availability of water.

Equal number of the respondents (43.89%) strongly agreed on the statement that use of treated water will affect the health of farmers, found groundwater contamination after the implementation of project the treated water sometime consists of human fecal waste,

TABLE 4

Statement wise perception of farmers towards K.C. valley project

(n=180)

Statements	SA	A	UD	DA	SDA	Mean score	Rank
Do you perceive treated water is harmful for consumption	65 (36.11)	59 (32.78)	56 (31.11)	0 (0.00)	0 (0.00)	4.05	III
Do you perceive treated water smells and it is unhygienic	42 (23.33)	101 (56.12)	31 (17.22)	6 (3.33)	0 (0.00)	3.99	IV
Do you perceive, the use of treated water will affect the health of the farmers and animals	79 (43.89)	60 (33.33)	24 (13.33)	17 (9.44)	0 (0.00)	4.12	II
KC valley project helped in increasing ground water table	155 (86.11)	19 (10.56)	6 (3.33)	0 (11.11)	0 (0.00)	4.83	I
Do you find groundwater contamination after implementation of project	79 (43.89)	12 (6.67)	32 (17.78)	57 (31.67)	0 (0.00)	3.63	XV
Increase in ground water availability will increase the agricultural production as well as productivity	36 (20.00)	29 (16.11)	77 (42.78)	34 (18.89)	4 (2.22)	3.33	XVIII
Do you have trust in the technology for making water safe for reuse	0 (0.00)	7 (3.89)	43 (23.89)	65 (36.11)	65 (36.11)	1.96	XX
Irrigation with waste water allows you to produce high value crops	50 (27.78)	55 (30.56)	33 (18.33)	30 (16.67)	12 (6.67)	3.56	XVII
Do you perceive, project helps in effective utilization of waste water	72 (40.00)	40 (22.22)	34 (18.89)	26 (14.44)	8 (4.44)	3.79	IX
Do you perceive , because of increase in ground water availability cropping pattern has been changed	77 (42.78)	38 (21.11)	17 (9.44)	40 (22.22)	8 (4.44)	3.76	XI
Cropping intensity has been increased after the implementation of KC valley project	57 (31.68)	87 (48.33)	23 (12.78)	4 (2.22)	9 (5.00)	3.99	IV
Do you perceive, treated water reduces the demand and stress on fresh water supply	59 (32.78)	32 (17.78)	70 (38.89)	15 (8.33)	4 (2.22)	3.71	XIII
Do you perceive, treated water increases the nutrient availability to the crop	77 (42.78)	30 (16.67)	45 (25.00)	21 (11.67)	7 (3.89)	3.83	VIII
Do you perceive use of treated water can leads to lower production cost and is economical	61 (33.89)	54 (30.00)	15 (8.33)	44 (24.44)	6 (3.33)	3.67	XIV
Irrigation with treated water will act as insurance against drought and seasonal variability	63 (35.00)	70 (38.89)	12 (6.67)	27 (15.00)	8 (4.44)	3.85	VII
Is there is increasing in livestock farming by cultivation of more pasture through treated water	64 (35.56)	34 (18.89)	37 (20.56)	40 (25.56)	5 (2.78)	3.62	XVI
Sewage treated water helps in increasing the speed of growth of crop	35 (19.44)	62 (34.44)	16 (8.89)	46 (25.56)	21 (11.67)	3.24	XIX
Do you perceive , waste water will be an alternative to fresh water irrigation sources	61 (33.89)	62 (34.44)	21 (11.67)	24 (13.33)	12 (6.67)	3.76	XI
Are you willing to pay for treated waste water and improved drainage facilities	69 (38.33)	41 (22.78)	40 (22.22)	23 (12.78)	7 (3.89)	3.79	IX
Do you perceive, your income has been increased after the implementation of project	54 (30.00)	66 (36.67)	46 (25.56)	11 (6.11)	3 (1.67)	3.87	VI

medicinal and industrial wastages; if the water is not treated properly it may cause harmful effect on human beings. Direct consumption of water by humans as well as animals for drinking purpose has caused diarrhea and vomiting. Direct release of improperly treated water may contaminate the groundwater. Hence they perceive that in the long run treated water will affect the health of the farmers. Due to increased water availability to farmers, farmers started fodder crops in the waste land, when water flows through the channel pasture growth has become more prominent in that area that has given chance for rearing more livestock animals in that area. While informal discussion with the researcher some of the respondents expressed that some of the animals died by consumption of sewage water directly from the lake. So, people might have negative opinion about water quality.

More than fifty percent of the respondents (56.12%) agreed that treated water smells and it is unhygienic. Some bacterial growth occurs in the drains, some anaerobic decomposition of organic compounds will takes place. More than two fifth of the respondents (43.89%) agreed that waste water will be an alternative to fresh water irrigation sources. The probable reason may be that, famers are using treated water as alternative for all the domestic as well as irrigation purposes as a result they perceive waste water is an alternative to freshwater irrigation source.

Nearly fifty percent of the respondents (42.78%) were undecided about the statement ground water availability will increase the agricultural production as well as productivity. About 40.00 per cent of the respondents disagreed the statement that sewage treated water helps in increasing the speed of growth of crop.

None of them strongly disagreed on the statement that do you have trust in the technology for making water safe for reuse. Famers are not having trust in the technology, because sometime water color is not good, it smells and they feel that it is unhygienic. Hence, frequent checking of the quality of water as well as soil needs to be done in project area to make water safe for reuse.

Significant per cent of farmers perceived that their income has been increased after the implementation of project, irrigation with treated water acts as insurance against drought and seasonal variability, use of treated water can leads to lower production cost and economical

Comparison of Perception of Marginal, Small and Big Farmers about K.C. Valley Project

Kruskal wallies test was applied to test the significant difference between marginal, small and big farmers. (Table 5). The mean rank obtained from the test for big farmers is 108.78 followed by small farmers (mean rank = 95.73) and marginal farmers (mean rank = 108.78) respectively. It is found that there is a significant difference in perception of marginal, small and big farmers about K.C. Valley project at one per cent of probability. Perception depends on individual and vary from one person to another person, small farmers perceive the things in one way, marginal farmers perceive in another way and big farmers perceive in different way. Hence, there exists a significant difference between them.

Majority of the respondents had both positive as well as negative perception about K.C. Valley project. Significant per centage of farmers expressed that the use of treated water will affect the health of the farmers and animals, treated water is harmful for

TABLE 5

Comparison of perception of marginal, small and big farmers about K.C.valley project

Category	Sample size	Mean Rank	H-Value	P
Marginal farmers	60	66.99	20.239	0.001
Small farmers	60	95.73		
Big farmers	60	108.78		

consumption in the long run as its smells and unhygienic. It indicates that people lacks trust and confidence in public agencies as well as decline in belief that best technologies can remove impurities and germs. In this regard, there is a need of multidisciplinary action in educating farmers to develop trust and confidence. Frequent water quality testing and monitoring is needed at the grass root level by concerned agencies so that in the long run farmers develops confidence about the technology followed to treat sewage water and use the water effectively and efficiently for agricultural and other purposes.

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