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A Study of the Imperatives and Repercussions of Sewage Water in Vegetables Production in District Faisalabad Pakistan: A Farmer's Perspective

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ABSTRACT

Pakistan is developing agricultural country where majority of population live in the rural areas. In Pakistan agriculture is the backbone of economy although industrial sector is growing very fast. The vegetable is grown in all rural and semi-urban areas but in the peri urban region of the country the production of the vegetables is very high. There are different challenges faced by the farmers to get the good yield of vegetables in which one of the biggest challenges is the shortage of clean water for the irrigation purposes. Therefore, the farmers are compelled to use sewerage water for the irrigation and vegetable production. There are two ways for utilizing the sewage water, it may be used as treated (recycled water) or non-treated (raw wastewater) source of water for irrigation and vegetable production. The treated and untreated sewerage water in Pakistan contain very high quantity of pathogenic microorganism, poisonous chemical and toxic industrial effluent. There is also very high quantity of metals like zinc, manganese, nickel, chromium, cadmium, and lead the sewerage water used for the irrigation and vegetable production.Therefore, the present study was conducted in peri-urban areas of Faisalabad. Initially four towns were selected through random stratified sampling and each comprising of 30 respondents.Sample of 120 respondents were selected. We used two methods for getting information, semi structured interviews scheduled either at the farms or the houses of respondents. Data were analyzed using both descriptive and inferential statistics through the statistical package for social sciences (SPSS).Vegetables irrigated by sewage water (industrial and domestic) serious hazards to plant and ultimately to human health. Industrial wastewater causes gathering of heavy metals in plants that are contaminated and cause of stop of crop growth and consequence of seed propagation. The Insufficiency of additional water assets is a major problem, because of which asset under privilege nations are exploiting negligible superiority water for water

system purposes. The sewage water should not be used for drinking purpose for animals because it causes abnormalities in animals. The discharge of unprocessed effluents, solid wastes and wastewater from industries, households and institutions are the main foundations of water pollution.
Keywords: Recycled water, Consequences, Seed propagation,Effluents, Vegetables

1. INTRODUCTION

1.1 Scarcity of Fresh Water on a Global Scale

Water is amongst the most essential components of life.However, water hasquantitative limitations,and the water is qualitatively vulnerable. New research indicated that Freshwater is available in small quantity and is not sufficient to meet the demand of rapidly growing population on a large scale. The demand for clean and pure water has increase due to high population growth, demographic extension, and improved standard of living. As the result of all these socioeconomic values, shortage of freshwater and the contamination of this precious source with poisonous pollutant have become the most concerning issues worldwide. As the freshwater scarcity is great concern so the farmers are compelled to use the wastewater for the vegetable and crop production. Wastewaters which is used for the irrigation and cultivation purposes contain substantial amount of inorganic and organic nutrients which are considered important for plant metabolism. But this practice also poses serious hygienic, ecological and health issues due to the presence of toxic substances such as heavy metals. Pakistan nowadays also suffer from severe freshwater shortage problem. (Natasha*et al.*, 2020).

The scarcity of water for irrigation is a major problem forcing asset poor farmers to utilize sewerage water for vegetable production (Musa *et al.*, 2013). The sewerage water may be comprised of some organic nutrients which are valuable for farming; nonetheless, it also accepts thelargenumber of metals to floras and soil (Rattan *et al.*,2005). The untreated water likewise comprises of modern industrial and household wastes and poisonous metals, contaminating soil and natural food chain (Khan *et al.*, 2008). In Pakistan insufficiency of irrigation system, forces farmers for the utilization of ground water and wastewater for horticulture (Khan *et al.*, 2013). Some urban areas of Pakistan produce around 116,590 million gallons/day of sewage water, good for watering 32,000 ha of land (FAO, 2002; Musa*et al.*, 2013).

Water shortage is becoming an impediment to the development and wellbeing of human beings particularly in several arid and semi-semi-arid regions where the restricted normal water assets are vigorously misused. Further increase in this shortage undermines monetary advancement and the maintainability of human occupations and affects the economic development (Scott *et al.*, 2004). The treated spilling out of the sewage stations is viewed as worthy to some degree because of not utilizing Chlorine in taking out organisms. It is worth noting that the nature of the effluent is also critical, not only for consistency to comply with the regulations to ensure that it is fit for consumption for vegetable production but also to ensure it is safe for the people in the surroundings in case of a coincidental contact (Rageh, 2014)

Vegetables are consumed all over the world due to their unique nutritional value. Because it is a good source of carbohydrates, proteins, vitamins, minerals, and trace elements, its consumption has been steadily increasing in recent years, particularly among the urban population (Kearney, 2010).Heavy metal-contaminated soils, particularly those near industrial areas, are more toxic than others (Bai *et al.*, 2011). Vegetables grown in these areas have higher levels of residual metals

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entering the food chain. To run off or leach down these toxic elements from the root zone, specific precautions such as frequent heavy irrigation are required (Wuana and Okieimen, 2011).

Unfortunately, in Pakistan, vegetables are irrigated with waste water, which is rich in organic matter but also contains heavy metals. Despite this, farmers wash them in waste water before bringing them to market. When vegetables from such areas with high metallic content are consumed, they deposit in adipose tissues in the human body (Shi *et al.,* 2011). Humans who consume waste irrigated vegetables have been found to be at risk of a variety of fatal diseases such as cancer, hepatitis, and kidney failure.

1.2 Wastewater Recycling

Mostly wastewater is used illegally in agriculture, posing long-term dangers to the environment and public health. Wastewater reuse demands scientific research as it helps to reduce the burden of water usage while also reducing water pollution (Jaramillo & Restrepo, 2017; & Zada *et al.,* 2021).

Waste water has been diverted to agronomic grounds, where it will be used as a fertilizer for vegetables and crops (Cooper, 2007). In Latin America, about 400 m3 /s of raw sewage water is released and later used to irrigate diverse crops (Silva *et al.,* 2008).In terms of nutrients, waste water is a likely source of macro- (N, P, K) and micro-nutrients (B, Ca, Mg, Mn, Fe, or Zn) (Barreto *et al.,* 2013). Water has a wide range of impacts on the physical and physiological properties of the soil and plants (Salam, 2020).

Various studies have shown that the presence of heavy metals such as chromium, cadmium, and lead, even in very small quantities are very harmful to the consumers. The root vegetables grown on sewerage water and eventually consumed by humans pose a considerable threat of poisoning by the heavy metals. In China, various studies on this subject have documented that the heavy metals in sewerage water pose considerable threat to even the people of the surrounding areas. The absorption of heavy metals may also differ from one vegetable to the other depending on the absorption and utilization by the plant. Also, heavy metals substantially exist in varying amount in different quantities depending on the structure of various vegetable species as well. Leguminous vegetables will most likely accumulate more chromium, while leafy vegetables tended to show higher amounts of cadmium and lead. Melons of different kinds have generally a low propensity to gather these three heavy metals. The exchange factors affecting heavy metal absorption from soil to vegetables may also be dependent on soil organic matter and soil pH (Chen *et al.,* 2014).

Over the time, the water demand for human and agricultural consumption has exceeded the current supply of surface and ground water, primarily because of rapid urban and industrial developments in urban and peri urban areas. The major crops consume 66% of accessible water resources which is considerably very high. The remaining water supply faces a fierce competition from urban and industrial development. Furthermore, in many parts of country there are strict laws, banning the mining of the underground aquifers resulting in the use of low-quality water for the vegetable production. Also, the use of untreated effluents to arable grounds likewise includes certain ecological and agricultural risks (Al-Jaloud*et al.,*2007).

The re-utilization of wastewater in agribusiness is increasing more extensive acknowledgment in many parts of the world. It represents to an agronomic choice that is increasingly being examined and taken up in locales with water scarcity, developing urban population, and rising interest for irrigation system water (Meli *et al*.,2002; FAO, 2011).

1.3Recovery and Concentration of Nutrients in Wastewater

Septic systems, nutrient recovery (NR), waste water treatment plants (WWTPs), and waste sludge treatments are regarded as the most experienced method among waste source recoveries, for example, animal nourishing, agronomic farming, and industrialized pretreatment services have established considerable importance over the previous decades as a result of applied observations and accessible organization at WWTPs (Shaddel*et al.*, 2019).

After treatment, few nutrients in wastewater mud are typically reprocessed and returned to agricultural soils via direct application to the land, such as liming, composting, and anaerobic digestion. On the other hand, these methods have drawbacks, such as a lack of complete guarantees regarding the reliability, satisfaction, and accessibility of nutrients, as well as human health hazards caused by the presence of pathogens, organic pollutants, and heavy metals in soil useful mud (Shaddel*et al.,* 2019).Wastewater contains nutrients that are required for human food consumption. Inorganic fertilizers (NPK fertilizers) are widely used in advanced farming systems (Kalsoom *et al.*, 2020; Rehman *et al.*, 2020).

Besides this, the nutrients naturally found in waste water allow for fertilizer savings (Drechsel *et al.*, 2010;Corcoral*et al.,* 2010), while also inhibiting the unplanned arrival of macro-nutrients (particularly nitrogen and phosphorous) and micro-elements to aquatic reservoirs via a secure as well as environmentally beneficial nutrient cycle.

1.4Beneficial Effects of Wastes on Vegetables

Globally, human waste is regarded as a valuable source of nutrients for vegetables, and organic/living materials improve soil quality, creating a favorable environment for microbes and increasing soil fertility (O'Connor *et al.,* 2005; & Ilahi *et al.*, 2020). Unprocessed raw sewage (e.g., wastes held by a community gutter system) or septate (e.g., wastes held by a suburban septic system), unprocessed sewage sludge (e.g., those solid materials rescued from wastewater management), or processed sewage sludge may be accumulated.

The use of wastewater for irrigation can have a significant impact on reducing water pollution, increasing water use, and restoring soil nutrient content (Jahan *et al.,* 2020). The sewage water is being utilized for growing various vegetables in the urban areas of Pakistan. A few factors responsible for this is: the relatively closer proximity of the market of urban centers and low transportation cost to bring the off take to the market; no need of cold storage; shortage of clean water for irrigation and the free of cost and abundant supply of sewerage water. The leafy vegetables mostly in high demand are radish, cauliflower, cabbage, carrot and turnip; and are also the root vegetables which are mostly affected by the heavy metals in water. The sewerage water is reported to be considerably deteriorating the quality of root mass, which is ultimately used for human consumption. On the other hand, some leafy vegetables, for example cabbage, spinach, and cauliflower, grow quite well in the sewage water.

The use of untreated wastewater, no doubt, presents a high degree of threat to human wellbeing in all ages and social groups. Nevertheless, the level of risk may change among the diverse age of social groups (Ratten*et al.,* 2005). The use of sewerage water on farm produce was also reported to be a cause of many infections and parasitic infestations among users. Untreated wastewater carries a very higher degree of the hookworm eggs which may enter in the food chain and result in the hookworm infestations among consumers (Feenstra *et al.,* 2000). The excess of metals in wastewater represents a significant danger if they are consumed in sufficient quantities and can be unsafe.

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Treated wastewater can be used for the irrigation of an assortment of field crops and plantations, with preparing root vegetable, in areas with limited regular water for agrarian purposes (Oron *et al.*,1992). Its necessity be specified, that heavy metals gather chiefly in the basic framework (Berry *et al.*,1980), and just a little rate shows up in the leaves, and unmoving littler, in the consumable vegetable parts (Kirkham, 1986).

Objectives of the study

Following objectives were investigated during the study

1. To identify the demographic characteristics of the farmers growing vegetables using sewage water.
2. To explore the traditional narrative about sewage water, use and its impact on vegetable production.
3. To assess farmer's perception about the impact of sewage water use on the quality of soil, extent of soil pollution and soil degradation as a result of sewage water applications.
4. To suggest recommendation for effective management of sewage water uses.

2. METHODOLOGY

The present research was planned to study the imperatives and repercussions of sewage water in vegetables production in Faisalabad district from the grower's perspective. The research was conducted in four peri urban regions with thirty respondents in each village.

Stratified random sampling method was employed to divide the population into four peri urban strata. These strata were comprised of four territories of Faisalabad i.e., Iqbal Town, Madina Town, Lyallpur Town and Jinnah Town. The disproportionate stratification was used based on shared attributes and characteristics of population such as use of sewerage water for irrigation, peri urban vegetable production, farmer's belief system about wastewater and socio-economic conditions. It was planned to interview the key informants on their farms. For this purpose, the initial contact was made to share the objectives of study, and logistical needs were discussed. The participants of the research were assured that privacy and confidentiality will be maintained and all the personal information will be kept confidential. Furthermore, the researcher ensured to maintain a very cordial and equitable environment while accommodating any last-minute issue. The questionnaire was prepared in Urdu, keeping in mind the intellectual level of the respondents. The respondents were also facilitated by providing the local language translation (Punjabi) for further elaboration of questions. The researcher also ensured to keep the neutrality while differentiating teen perception vs. reality and maintaining a bias free, non-judgmental environment. To verify the validity and reliability of information, the questionnaire was pre-tested with 30 respondents. The interviews for pre-testing were scheduled at their farms and/ or homes. The key informant survey was scheduled for a maximum of 30 minutes' slot. The information was recorded by the researcher and clarity was sought for accuracy. All the questionnaires were reviewed to ensure that all relevant information has been captured and gaps, if any reviewed and fulfilled in a timely manner. The gathered information was measurably investigated along the assistance of SPSS (Statistical Package for Social Sciences). Spellbinding factual measures e.g. standard deviation, mean, rates, and frequencies were ascertained to interpret exchange and reach determination and to figure out recommendations.

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Fig#1: Map of Peri-Urban Areas

3. RESULTS AND DISCUSSION

Age

Age refers to the measure of years finished by a person since his birth to the world. In view of age, the respondents were appropriated into four classifications i.e. 15-30 years, 31-45 years, 46-60 years, or more 61.

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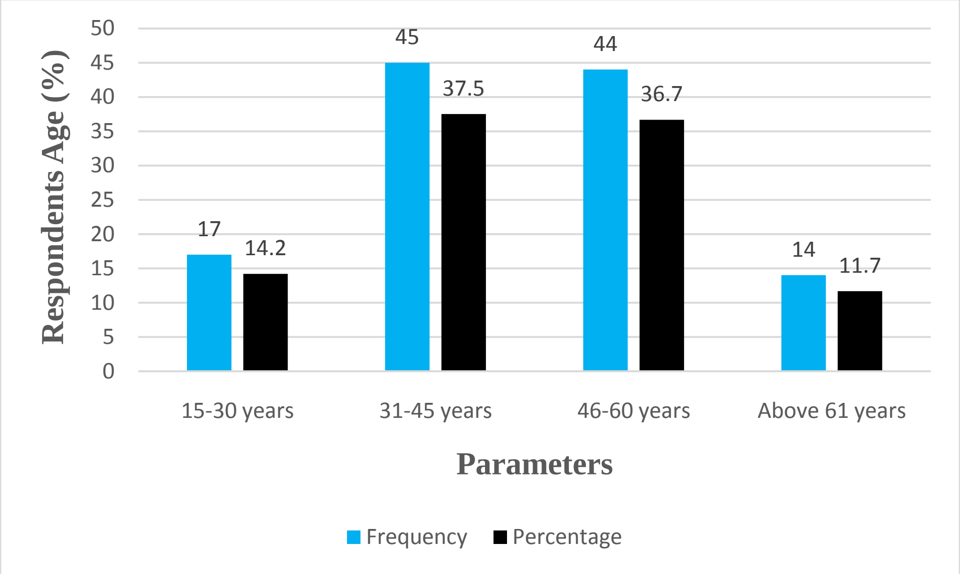
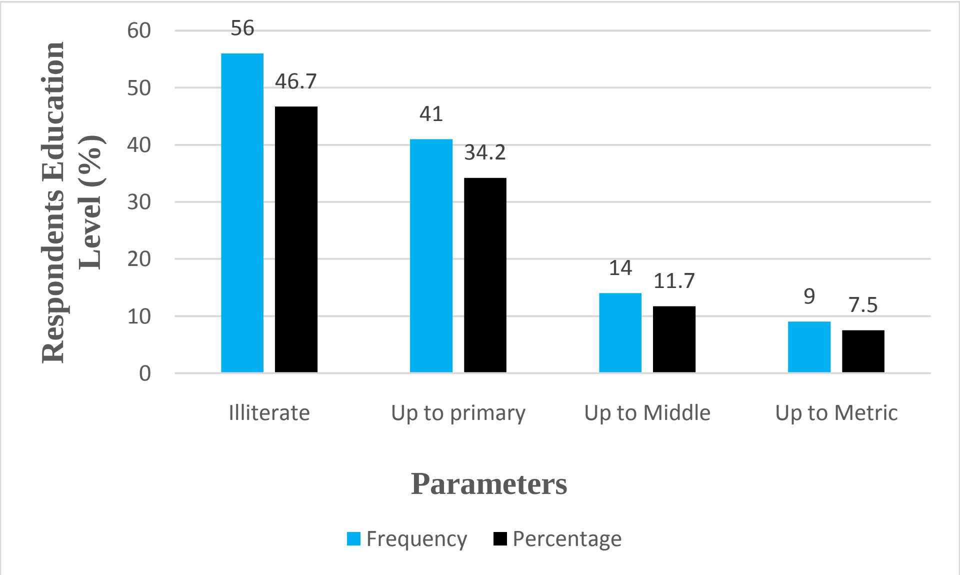


Fig.2: Distribution of respondents according to their Age (in years)

In the given graph revealed that the majority (37.5%) of the respondents were belongs to the age group between 31-45 years. About one-third (36.7%) were between 46-60 years, only (14.2%) were belonged to the age group between 15-30 years and small number of respondents and (11.7%) were above 61 years of age.

Education of respondents

Education is the greater part of the procedure for achieving attractive changes in human conduct. Education is the aggregate of the significant number of the strategy for the accomplishing appealing changes in human conduct.



Fig#3: Distribution of respondents according to their Education

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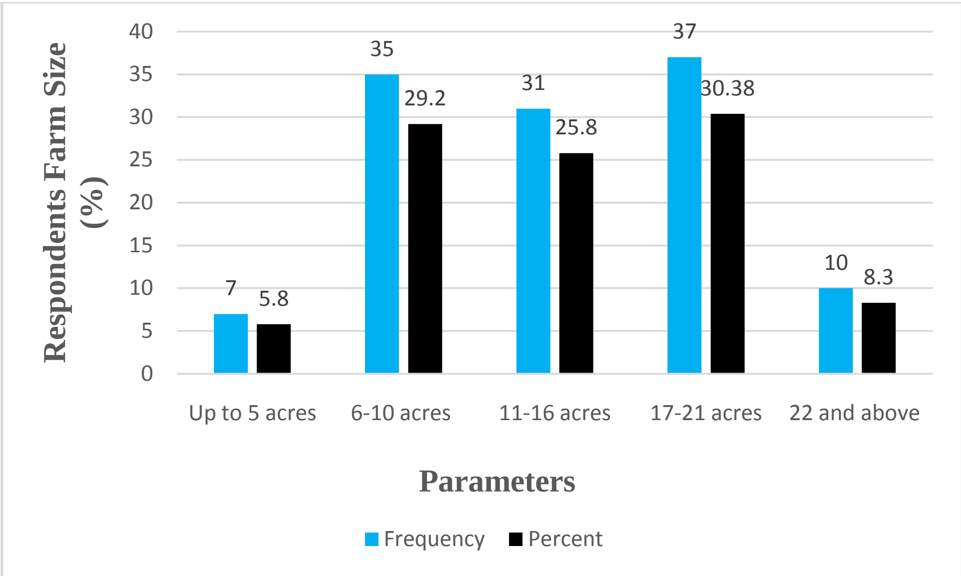
The graph shows that less than half (46.7%) of respondents were illiterate followed by up to primary, up to middle, up to metric with the contribution of 34.2, 11.7 and 7.5% respectively.

Farm size and Vegetable growing experience

The farm measure has a huge and basic part in the appropriation or dismissal of any innovation or thought. Bigger the size of land, higher will be the reception qualities for horticultural advancements among farmers. Respondents in such manner were ordered into five gatherings i.e., up to 5 acres of land, 6-10 acres of land, 11-16 acres of land, and 17-21 acres of land or more 22 acres of land.Experience of farmers is very important for the adoption of innovation. It increases with the increase of age.



Fig#4:Distribution of respondents according to their Farm size

According to results shows in the graph 4 about one-fifth 30.8% of the respondents were 17-21 acres of farm size, 5.8% of the respondents were up to 5 acres of farm size, 29.2% of the respondents were 6-10 acres of farm size, 25.8% of the respondents were 11-16 acres of farm size and only few 8.3% were above 22 acres of farm size.

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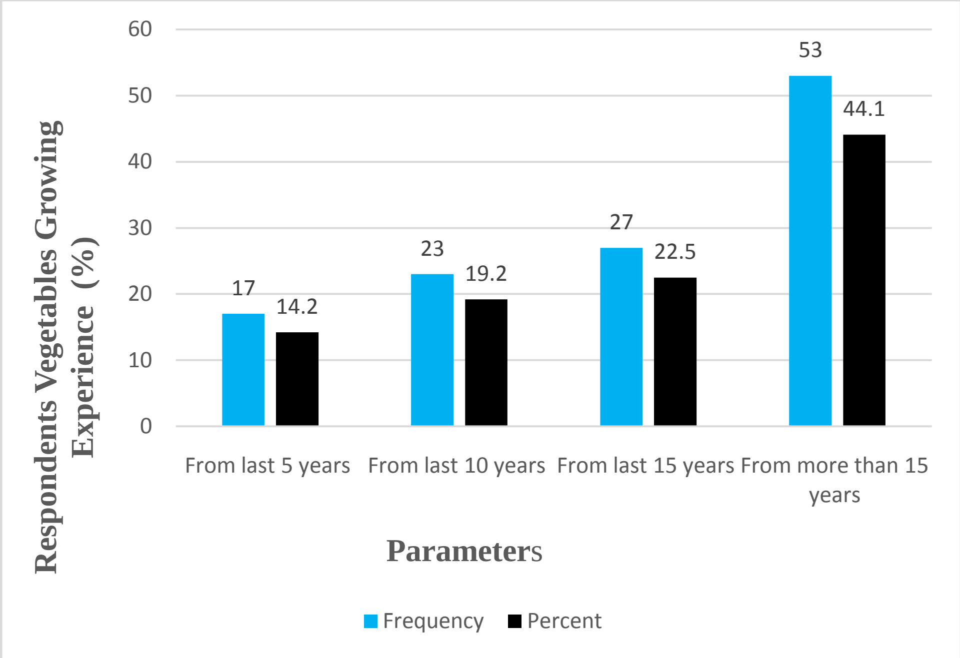

Fig#5: Distribution of respondents according to their vegetable growing experience

The data in given graph 5 depict that only 14.2% of the respondents had from last 5 years of experience,19.2% of respondents had from last 10 years of experience, about one-fifth 22.5% of the respondents had from last 15 years and less than half 44.1% of the respondents had experience from more than 15 years.

Source of Sewage Water Usage

The distribution of thewastewater is given in graph. The graph 6 shows that 12.5% of the respondents were using industrial wastewater, whereas 34.2% of the respondents were using domestic wastewater and more than half 53.3% of the respondents were using both. It was reported that the canal water although was present in small amount but was not enough to fulfill the water requirements of the farmers. The direct application of sewage water especially industrial water has been proved to destroy the roots of the plant and contaminating soil in other studies. Although the exact extent of the impact of the use of industrial wastewater on soil and vegetables could not be ascertained but farmers did mention that the quality of soil and produce over the time has deteriorated significantly. These finding were in line with the soil degradation and loss of quality as a direct impact of use of untreated wastewater as reported by Rattan *et al.*, (2005). Some farm owners also reported that the soil discoloration and presence of green and dark brown tinge in soil is a physical evidence of the heavy metals presence in soil as the result of the use of industrial water. The soil deterioration can be attributable to the heavy metal contamination (Khan *et al.*, 2008). However, the study was not aimed to quantify metal poisoning and its impact on vegetables and consumers, but the farming community was cognizant to the fact that there is an increased outbreak of dysentery and respiratory problems in the surrounding population of the locale.

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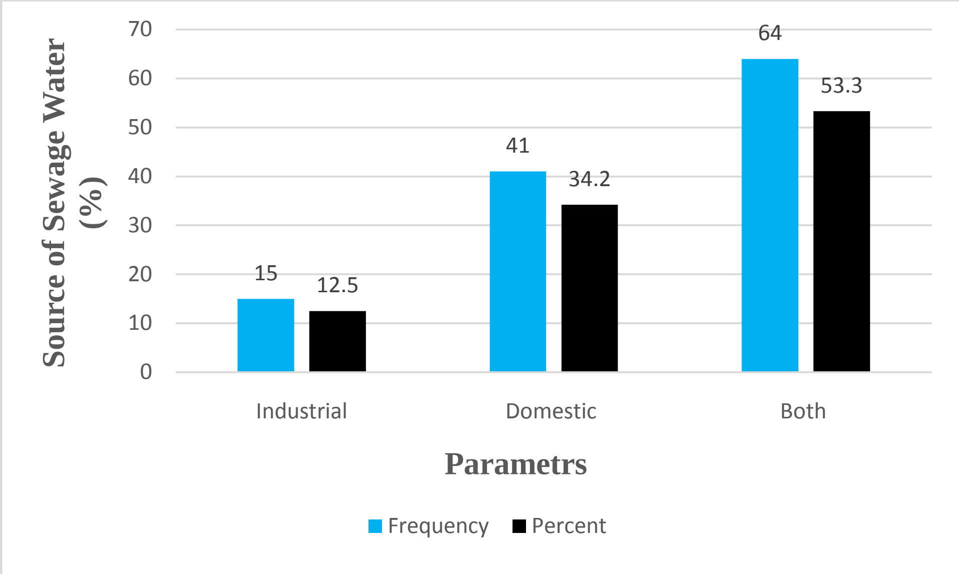

Fig#6: Distribution of Respondents Regarding Source of Sewage Water Usage

Table#1: Distribution of Respondents Regarding the recommended Way of Sewage use

Response	***f***	**%**
Yes	28	23.3
No	92	76.7
Total	120	100.0

There are many measures and approaches are accessible to adeptly treat the left-over water community wastewater treatment is as well-developed engineering science. The Table indicates that the 23.3% of the respondents replied yes they know the recommended way of sewage water use and that way was putting sewage water in a big area free for some time after settle down of the hard material found in the water, 76.7% of the respondents said no they don't use the recommended way of waste water.

Table#2: Distribution of Respondents Regarding the knowledge of sewage water use hazards

Response	***f***	**%**
Yes	80	66.7
No	40	33.3
Total	120	100.0

In this Table demonstrate that respondents were asked about do you know about the hazards of sewage water use and more than half 66.7 of the respondents said they know the hazards of sewage water and 33.3% said they don't know. In this result the use of sewage water for irrigation, is a high hazard to human health in all age of group. But it may vary among the many age groups. It may cause infection between children and lead to higher existence of hookworm.

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Table#3: Factors to use the sewage water in vegetable production

Factors use the sewage water in vegetable production	Weighted score	Mean	S.D	Rank order
Spatio-temporal availability	325	2.70	0..95	1
Improved plant growth	278	2.02	1.19	2
Sewage water use improves soil fertility	274	2.93	1.12	3
Cheap source of irrigation	272	2.49	1.02	4
Sewage water application helps get higher yields	260	2.16	1.21	5
Sewage water use reduces fertilization application	232	1.93	1.08	6
Poor quality groundwater	232	1.93	.764	7
Unavailability of canal water	182	1.51	.579	8

Table shows that the information collected on spatio-temporal availability was ranked 1st with mean value 2.70 and weighted score 325 which fell between high and very high. This could be attributable to the abundance and around the clock supply of untreated wastewater. The access channels are easy to dig and maintain and water flows irrespective of any seasonal variations. In general, there was an appreciation among people that the wastewater is being reused. Improved plant growth was ranked 2nd with mean value 2.02 and weighted score 278, fell between high and very high. The study found that vegetable crops show a rapid growth, some farmers were even of the belief that the plant growth is twice as much as compared to the fresh water. Apparently, there was no difference in the quality of produce. Similar findings were reported by Shuval*et al.*,(1986).

Whereas sewage water use improves soil fertility was ranked 3rd with mean value 2.93 and weighted scoring 274 which fell between high to medium. The study was not aimed at to determine the extent to which the soil fertility improved or deteriorated by irrigation through wastewater, but the farmers could easily identify discoloration of a few soil patches due to accumulation of heavy metals.

Cheap source of irrigation was ranked 4th with mean value 2.49 and weighted score 272. The cost of agricultural inputs has increased tremendously over the time;therefore, the farmers in the study area were very appreciative of the free of cost source of irrigation. The wastewater is regularly pumped out of the pumping stations to avoid accumulation of water in the nearby settlements. This practice to use wastewater in the arid and semiarid regions of the world is very much common as reported by Scott *et al.*,(2004).

The common perception among the farmers was that the sewage water application helps get higher yields was ranked 5th with mean value 2.16 and weighted score 260 which fell medium to high. Sewage water use reduces fertilization application and poor quality of ground water was ranked 6th or 7th with mean value 1.93 and weighted score 232, respectively. Unavailability of canal water was ranked 8th with mean value 1.51 and weighted score 182. Majority of the respondents said unavailability of canal water is very important factor to use the sewage water in vegetable production.

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Table# 4: Distribution of the respondents according to the farmers perception about the impact of sewage water on the quality of soil.

Farmers Perception about the Sewage water on the quality of soil	Strongly Disagree		Disagree		Moderately		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Sewage water use affects physical, chemical, and biological properties of soil	2	1.7	16	13.3	20	16.7	45	37.5	37	30.8
Swage water is a causing of salinity	4	3.3	20	16.7	38	31.7	54	45.0	4	3.3
Sewagewater use reduces nutrient efficiency	4	3.3	35	29.2	28	23.3	32	26.7	21	17.5
Sewage water use destroys the microbes in soil	0	0.0	43	35.8	22	18.3	32	26.7	23	19.2
Sewage water cause soil erosion	2	1.7	40	33.3	29	24.2	23	19.2	26	21.7
Sewage water use has negative impacts of the quality of vegetable production	4	3.3	22	18.3	42	35.0	35	29.2	17	14.2
Sewage water cause soil pollution	0	0.0	37	30.8	27	22.5	26	21.7	30	25.0
Sewage water cause soil degradation	8	6.7	30	25.0	22	18.3	37	30.8	23	19.2

In this table Sewage water has high impact on quality of soil. It is depicted from the table that most of the residents said that use of sewage water highly effects on physical, chemical and biological properties of soil. One-fourth of respondents argued that soil pollution causes due to use of sewage water. Less than one-fourth (19.2%) of respondents said that sewage water highly causes soil degradation and destroy the microbes in soil. Microbes are very important for fertility of soil and enhance the production of vegetable. It reduces the nutrient efficiency. Less than half (45%) of respondents said that their crops were affected by sewage water regarding causing salinity. More than one-fourth (29.2%) of respondents said sewage water has negative impact on the quality of vegetable production.

Table#5: Farmer'spreference to get information about vegetable production

Source of information	Weighted score	Mean	S.D	Rank order
Fellow farmers	380	3.16	1.147	1
Private sector	228	1.80	.815	2
Print media	221	1.84	.840	3

Electronic media	217	1.80	.882	4
Public sector	210	1.75	.801	5

The table shows that when farmers were asked about the sources to get information about vegetables production, they ranked the advice by the fellow farmers as the 1stpreference with the mean value 3.16 and weighted score of 380. The advice from private sector was ranked 2nd with mean value 1.80 and weighted score 228. The next in priority to seek information by the farming community of the area was print media, with mean value 1.84 and weighted scoring 221 which fell between low and medium category. Whereas electronic media was ranked 4th with mean value of 1.80 and weighted score 217 which fell between low and medium category. Public sector was ranked 5th with mean value 1.75 and weighted score 210. The value fell between low and medium category.

Table# 6: Distribution of the respondent's according to perception regarding toimpact of sewage water on human health.

Perception regarding to impact of sewage water on human health	Strongly Disagree		Disagree		Moderately		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Headache	19	15.8	68	56.7	30	25.0	3	2.5	0	0.0
Fever	10	8.3	52	43.3	51	42.5	6	5.0	1	0.8
Stomach problem	16	13.3	35	29.2	41	34.2	28	23.3	0	0.0
Vomiting	16	13.3	31	25.8	36	30.0	33	27.5	4	3.3
Hepatitis	5	4.2	60	50.0	31	25.8	19	15.8	5	4.2
Respiratory infections	8	6.7	34	28.3	48	40.0	17	14.2	13	10.8

Results indicates that 27.5% of the respondents were think it cause vomiting and they are agreed, 23.3% think it cause stomach problems,15.8% think it cause hepatitis, 14.2% think it cause respiratory infections, 5.0% think it cause fever and 2.5% were agreed and think it cause headache. About the majority of respondents disagreed and thinks it has no effect on human health because many other problems are also there farmers don't know.Results indicates that 27.5% of the respondents were think it cause vomiting and they are agreed, 23.3% think it cause stomach problems,15.8% think it cause hepatitis, 14.2% think it cause respiratory infections, 5.0% think it cause fever and 2.5% were agreed and think it cause headache. About the majority of respondents disagreed and thinks it has no effect on human health because many other problems are also their farmers don't know.

4. Conclusions

Vegetables irrigated by sewage water (industrial and domestic) serious hazards to plant and ultimately to human health. Industrial wastewater causes gathering of heavy metals in plants that are contaminated and cause of stop of crop growth and consequence of seed propagation. The

Insufficiency of additional water assets is a major problem, because of which asset under developing nations are exploiting negligible superiority water for water system purposes.

The sewage water should not be used for drinking purpose for animals because it causes abnormalities in animals. The discharge of unprocessed effluent, solid wastes and wastewater from industries, households and institutions are the main foundations of water pollution.

Recommendations

- Steps should be initiated by appropriate authority to undertake measures to treat the sewage water and make it safe for irrigational purposes.
- Vegetable production must be carried out in regions with high availability of water. However, during seasonal shortages the treat sewerage water may be used for vegetable production.
- Adequate training should be imparted to farmers in the regions where wastewater is being used.
- The present efficiency of production may be increased so that the low level of inputs is required.

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