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Role of Information Sources in Improving Farmer's Knowledge Regarding Health Hazards Pertinent to Waste Water Irrigation in Vegetables

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ABSTRACT

About 90% of wastewater formed universally remains unprocessed, causing widespread of water contamination, specifically in developing countries. In Pakistan, wastewater is being used for irrigation purpose in many peri-urban regions where growers have small agricultural land and water effluents are easily available generally in very cheap prices or even free of cost. Farmers generally rely on wastewater because of unavailability of other cheap and reliable sources of irrigation water. Wastewater is considered as beneficial for plant growth as a result effluents are extensively used for irrigation of crops. Vegetables are the important food which are essential for maintaining health, vegetable consumption has shown increasing trend due to good source of vitamins. With increase in demand famers are trying to get more yield to earn more profit which lead them to use sewage or industrial waste water in vegetable production which is cost effective and easily available all the time. The present study was conducted to access the role of information sources in improving farmer's knowledge regarding health hazards pertinent to waste water irrigation in vegetables. The study was conducted in peri-urban areas of Faisalabad, 4 towns (Jinnah town, Madina town, Lyallpur town, Iqbal town) were selected purposively and 30 respondents were selected using simple random sampling technique for interview from each town. Statistical software SPSS was used to analyze the data. In the results researcher found the reasons of wastewater use in vegetable production were, unavailability of canal water was ranked 1st, instant availability, high cost of tube well water, cheap source of irrigation, load shedding, increased soil fertility, improved plant growth, increased yield, best way of dispose of wastewater was ranked 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th respectively. Research also concluded that excess amount of toxic matters found in waste water can make soil unfertile and cause metabolic problems to humans and plants as well. Waste water should be regularly monitored to make sure the quality of water fit for vegetables. The lack of awareness among farmers on health hazards of untreated effluent also constitutes a major problem. Training and awareness to build skills and knowledge on using raw sewage for irrigation should be considered in planning process of re-use projects so as to protect all risk groups. Awareness campaigns and programmes should be conducted to educate and orient farmers on precautions of raw effluent use and inform consumers about the safety of agricultural products irrigated with sewage.

Key Words: Water Effluents, Vegetable, Farmer's perception, Peri-urban areas, Health hazards

1. INTRODUCTION

The contribution of horticulture sector in GDP of the Pakistan is 12 %. Vegetables are the short duration crops and are acceptable in all farming systems. However, due to unavailability of fresh water for irrigation and high cost of tube well water allow farmers to use sewage water. Sewage water is commonly use in vegetable production and it has been found that sewage water helps to increase production. More than thirty six varieties of vegetables are grown on large scale in Pakistan (Govt. of Pakistan, 2006).

Agriculture is a big source that supports life style of people and feed them globally. But, despite increase in yields resulting from application of inputs i.e. fertilizer, water and pesticides, new crop strains, and other technologies of the 'Green Revolution, we are unable to provide the required per capita food supply for reducing hunger, improving nutrition and sparing natural ecosystems for conservation. Because of increase in human population agricultural production is not matching with per capita requirements. Therefore, all emerging efforts are being taken into account to cope with such situation for integrity of mankind and biosphere (FAO, 2004). Agricultural practices determine the level of food production to a great extent. The state of the global environment and agricultural scientists are the chief managers of land use and development of sustainable agriculture (Tilman *et al.,* 2002).

In the past two decades, agricultural technology has changed from conventional method and techniques to new method and technique. The new agricultural technologies have established their superiority over the old ones. It is, therefore, believed that the adoption of such technologies will lead to enhance socio-economic development of the country. At present, adoption of agricultural technologies confined only to certain sections of farming community and this way create socio-economic disparities. As a result, new technologies will have to be developed which smaller farmer with different socio-economic conditions would eventually take up. Certain sections of farming community, who were supposed to be conservative and fatalistic, are now gradually moving from their status quo positions. Such type of changes may be occurring or will occur on different dimensions as the rapid advancement of technological knowledge will become part of the farming community. This pre-supposes not only a managerial view of development but also efforts to carry the new agricultural strategy, depending upon the potentiality for growth, based upon the characteristics of each region, to sectors of rural society not understood. (Santosh Swami, 2006)

Vegetables are the important food which is essential for maintaining human health. For normal metabolic activities, minerals are very essential ingredients of diet and vegetables are the excellent source of minerals. Vegetables also contain other valuable ingredients for building up and repairing the body tissues. They are used in different forms such as leaves, stems, fruits, edible roots etc. In short, we can say that vegetables are "natural reserves of nutrients gifted by Almighty Allah to human beings" (Hanif *et al.*, 2006). Pakistan exports different vegetables such as fresh potato, garlic and mushroom to different European countries. Use of sewage water effect vegetable properties and make them unhealthy for human consumption and it may cause serious problems for human health because of metals present in sewage water, this contaminated water when supplied to vegetables make them unhealthy for consumption especially in peri-urban areas. We are agricultural based country vegetables produced by sewage water can affect our export because developed countries don't compromise on quality of eatables. Such contamination results in big reduction in our export, earnings which are making our economy weak and unstable.

Untreated waste water possesses a greater risk to agricultural sustainability and public health. Zia, (2012) concluded that in Pakistan untreated waste water is used, here direct waste water has been used for centuries in aquaculture and agriculture.

Objectives of the Study

General Objective:

Role of information sources in improving farmer's knowledge regarding health hazards pertinent to waste water irrigation in vegetables

Specific Objectives:

i. To find out the demographic attributes of the respondents
ii. To probe out the knowledge of respondents regarding use of sewage water for growing vegetables
iii. To assess the factors those are directly related for use of untreated waste water by the farmers
iv. To suggest some policy recommendations for the better use of waste water

2. METHODOLOGY

Farmers growing vegetables in peri-urban areas of Faisalabad were served as study population. The survey research was conducted in peri-urban areas of Faisalabad. All the four towns of tehsil Faisalabad were selected focusing on vegetable growers. A complete list of vegetable growers (sampling frame) was obtained from the office of Fruit and Vegetable Development Project (F&VDP), Faisalabad. From the list, 120 vegetable growers who were using waste water for irrigation purpose served as study sample. Using Stratified sampling technique, 30 respondents from each town were selected. In order to collect the required information, an interview schedule was developed keeping in view the study objectives. It was pre-tested on 20 farmers who were engaged in vegetable production activities, In order to ensure the validity and reliability of interviewing schedule; those 20 farmers were other than 120 famers who served as study sample. Considering the result of pre testing, necessary changes were made in the interview schedule. The farmers were interviewed by researcher personally at their homes or farms. Although, the interview schedule was constructed in English, the questions were administered in local language (Punjabi) for the convenience of interviewees to get the required information with maximum accuracy. Due to illiteracy and suspicious nature of the farmers, a great deal of time had to be spent in explaining the purpose of the study and assuring them that the information collected from them would be kept secret and only conclusions would be published for educational purpose. After collection of data it were statistically analyzed by using computer software SPSS (Statistical Package for Social Sciences). Descriptive as well as inferential statistics was also applied for in-depth analysis.

3. RESULTS AND DISCUSSION

Health Hazards of sewage water used in irrigation

The main reasons of sewage irrigation are drought, high content of plant nutrients and year-round access of farmers to this source. The effluent is mainly used for raising vegetables and fodder crops because of the nearby markets. It is estimated that the application of 40cm of sewage effluent can add 100-200kg N, 6-20kg phosphorus and 100-250kg potassium, eliminating the need for artificial fertilizers. Untreated Wastewater contains parasite eggs or bacteria leading to cholera - but above all bacteria causing diarrhea. Children below the age of five are the most sensitive to diarrhea, often with fatal consequences. Globally, less than 10 percent of collected wastewater is treated. Together with rainwater, untreated wastewater ends up in rivers, gets diluted with clean drinking water, and enters the food chain. The World Health Organization estimates that more than 10 percent of the world's population consumes food produced with wastewater.

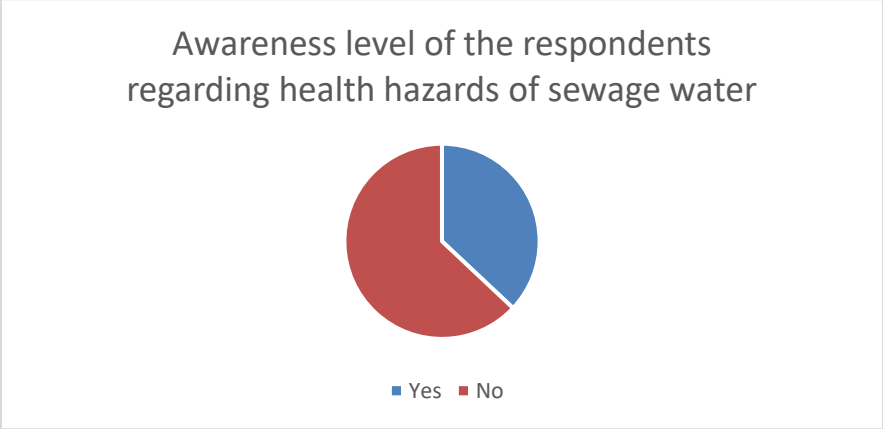

Figure 1 Awareness of the respondents regarding health hazards of sewage water use in irrigation

Figure 1 is reflecting the wide awareness gap among respondents about the health hazards of waste water which has been used for irrigation purpose only 37% of total respondents were known to health hazards associate with waste water irrigation which is quite restlessness particular in era when cities are usually vulnerable to chronic diseases.

Health Hazards Due to Waste Water Used for Irrigation Purpose in Peri-urban Areas

The use of raw sewage in agriculture is not without danger. The major risk in utilizing raw city effluent is food contamination by pathogenic micro-organisms and outbreak of water-borne diseases. Untreated city effluent contains full spectrum of pathogens (helminthes, protozoa, enteric bacteria and viruses) found in urban population and many of these can survive for several weeks when discharged into the fields. There are public health concerns for producers, handlers, consumers and communities using wastewater around production areas. These potential health risks are a major constraint of current wastewater use practices, and can possibly limit its long-term sustainability. Irrigation with raw sewage containing high level of trace elements and heavy metals is likely to be toxic to plants and also poses risk to human health. Heavy metal in sewage effluent for most developing countries is mainly related to the mixing of domestic and industrial wastewater in the same sewage system.

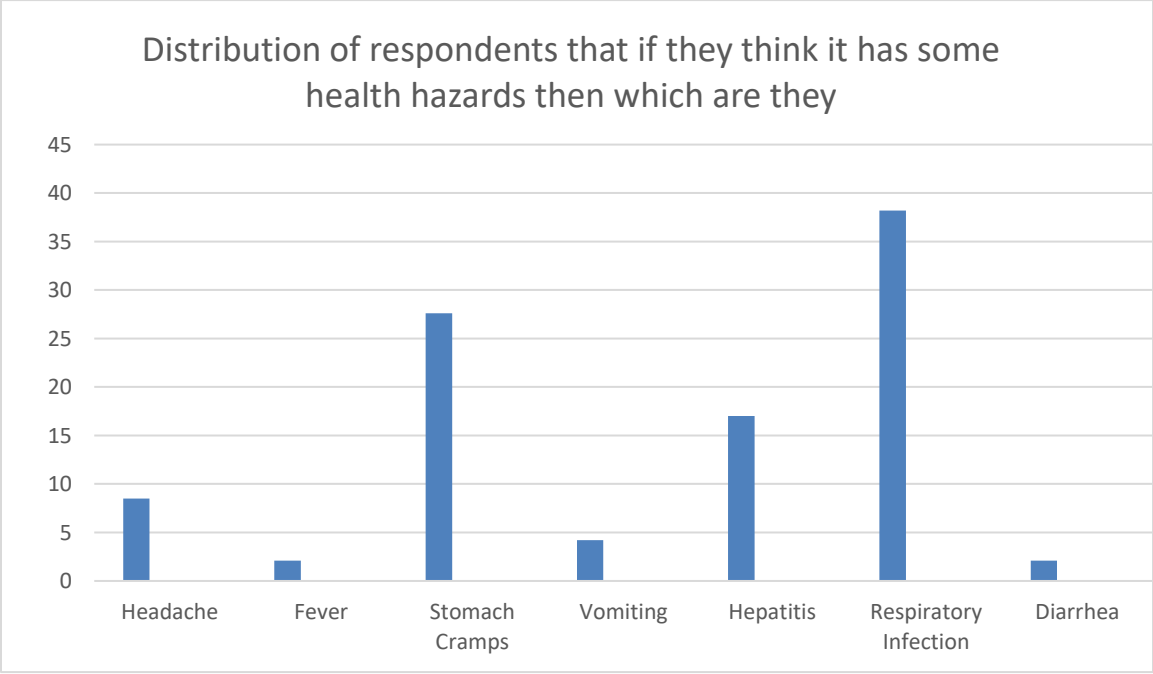

Figure 2 is replicating farmer's perceptions about diseases which can happened with the use of water effluents in vegetable production. Most of them think it can cause respiratory problems, Stomach cramps and hepatitis respectively. These results are

based on their assumptions. Most of farmers said that waste water causes respiratory infection, Stomach cramps, Hepatitis, Headache, vomiting, Fever and Diarrhea. Most heavy metals are carcinogenic and cause mental disorder, respiratory problems and hormonal imbalance. A more dangerous consequence of raw municipal effluent is transmission of heavy metals through animal milk into human as fodder grown by polluted water accumulates higher quantities of heavy metals in animals.

Information Sources of Sewage Water Hazards

The lack of awareness among farmers on health hazards of untreated effluent also constitutes a major problem. Training and awareness to build skills and knowledge on using raw sewage for irrigation should be considered in planning process of re-use projects so as to protect all risk groups. Awareness campaigns and programmes should be conducted to educate and orient farmers on precautions of raw effluent use and inform consumers about the safety of agricultural products irrigated with sewage.

Response	No.	Percentage
Yes	14	11.7
No	106	88.3
Total	120	100.0

Above table described that majority of the farmers 88.3% answered that no one is informed about hazards on waste water whereas only 11.7 % claimed that they have been informed by someone about the hazards of waste water. Agriculture is a complex business involving numerous risks and information is always helpful for farmers to cope with the challenges affecting productivity. Without information, farmers don't remain much successful in tackling the vulnerabilities. Shrivastava *et al.* (2010) described that most of the farming communities were unaware to work under scientific and modern directions due to the existing communication gap.. Information is obtained through valuable sources known as information source which may vary from person to person and from time to time. In ancient times, information availability and acquisition were hard to obtain and with the passage of time information availability and accessibility has become easier. Male farmers generally remain reliant on fellow farmers, friends, pesticide dealers, public and private sector extension workers. However, world has transformed into modern era, now more people had been found relying on information and communication technologies (ICTs), electronic media and print media. Some researchers (Nazam, 2000; Cheema, 2000; Barkat, 2002) indicated increased use of radio and TV as information sources to obtain desired information. Information sources were categorized into conventional and non-conventional or modern by Cheema (2000). Personal contact methods are examples of conventional sources, while mass contact methods imply the significance of modern information sources.

Role of Public and Private Sector regarding Sources of information about health hazards of waste water

Institutional factors like information and extension contacts are also found to be significant determinants of the adoption. The significance of information as a determining factor of adoption can be explained by the fact that when a farmer acquires full information about a given technology, it reduces the uncertainty about that technology's performance and this may change an individual's assessment from purely subjective to objective over time (Caswell *et al*., 2001). Moreover, when a farmer has information that a given technology is highly profitable, it positively influences that farmer's decision to adopt the technology (Feder and Slade, 1984). However, if the experience within the general population about a specific technology is limited, more information can negatively influence its adoption (Klotz *et al.*, 1995).

Table

Weighted score, mean value, standard deviation and rank order of sources preferred by respondents to get information about vegetable production

Sources of information	Weighted score	Mean	Standard Deviation	Rank Order
Govt. sector	377.00	3.14	0.872	1
Fellow farmers	349.00	2.90	0.879	2

Print media	346.00	2.88	0.712	3
Electronicmedia	329.00	2.74	0.727	4
Private sector	314.00	2.61	0.700	5

The given table above show that role of public sector in information dissemination ranks first with mean value 3.14 and then fellow farmers with mean value 2.90, Print media, electronic media, private sector with mean values 2.88, 2.74 and 2.61. Yet more efforts are required to provide information to the farmers regarding hazards of waste water which is commonly used in peri-urban areas to grow vegetables.

Reasons of Usage of Sewage water in vegetable Production

Like other developing countries wastewater is used for irrigation purpose in many peri-urban regions in Pakistan where growers have small agriculture lands and water effluents are easily available generally free of cost, because of unavailability of other cheap and reliable source of irrigation water. Wastewater is considered beneficial to plant growth as a result effluents are extensively used for irrigation of crops. With increase in demand farmers are trying to get more yields to earn more profit which lead them to use sewage or industrial waste water in vegetable production which is cost effective and easily available all the time.

Weighted Score, Mean, Standard Deviation and Rank Order of Reasons of Use of Sewage Water in Vegetable Production

Factors affecting use of untreated wastewater	Weighted score	Mean	Standard Deviation	Rank Order
Unavailability of canal water	530.0	4.41	0.616	1
Instant availability	514.0	4.28	0.723	2
High cost of tube well water	496.0	4.13	0.819	3
Cheap source of irrigation	470.0	3.91	0.773	4
load shedding	466.0	3.88	0.927	5
Increased soil fertility	438.0	3.65	1.050	6
Improved Plant growth	381.0	3.17	0.975	7
Increased Yield	305.0	2.54	0.708	8
Best way for dispose of wastewater	246.0	2.05	0.754	9

The above data show that different factors affecting the use of untreated waste water. Major factor is the Unavailability of canal water ranks 1st with mean value 4.41 because canal water is not available in Peri-urban areas for irrigation purpose and if available the amount of water is not enough to fulfill the demands of farmers. Then Second most important factor is instant availability of waste water with mean value 4.28. Almost waste water is twenty four hour available. Third most important factor is high cost of tube well water with mean value 4.13. Most of the farmers in Pakistan are small farmers and they are not in a position to afford tube well water. Waste water is cheap source of irrigation ranks 4th with mean value 3.91. Load shedding is also an issue ranks 5th with mean value 3.88. If farmers want to use tube well water then due to load shedding tube well water is not available at the time of need. Increased soil fertility, improved plant growth, increased yield and best way for dispose of waste water ranks 6th, 7th, 8th, and 9th with mean values 3.65, 3.17, 2.54 and 2.05. Waste water is rich source of nutrients like application of 40cm of sewage effluent add 100-200 kg N, 6-20kg phosphorus and 100-250 kg potassium, eliminating the need for artificial fertilizers.

Recommendations

- To ensure sustainable and safe use of wastewater for food production in urban and peri-urban areas, there is a need to explore management options.
- Training and awareness to build skills and knowledge on using raw sewage for irrigation should be considered in planning process of re-use projects so as to protect all risk groups.

- Awareness campaigns and programmes should be conducted to educate and orient farmers on precautions of raw effluent use and inform consumers about the safety of agricultural products irrigated with sewage.
- Regulations are also needed to control the re-use of treated sewage effluent.
- Sewage use scheme, if properly planned and managed can have positive environmental impacts. Some degree of treatment must normally be provided to raw municipal effluent before it can be used for irrigation. For local governments, using treated wastewater for irrigation can be beneficial, as an economically feasible and environmentally sound method of disposing municipal effluent.
- Putting restrictions on the type of crop that can be grown with raw effluent is another way of reducing risks
- Other simple options for farmers include changes in irrigation methods which can have low levels of risks. Using micro irrigation techniques to irrigate vegetables
- Waste water should be regularly monitored to make sure the quality of water fit for production vegetables.
- Factories should bound to eliminate treated waste water, like our neighbor country there is a need of priority government should formulate some farmer friendly policies like free electricity for tube well water, cheap agricultural inputs and easy access to market for better economy.

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Conflict of Interest:
The authors declare that there are no conflicts of interests.

Peer-review:
External peer-review was done through double-blind method.

Data and materials availability:
All data associated with this study are present in the paper.

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