

# CONSUMER'S VIEW ON AGRICULTURAL PRODUCTS PRODUCED WITH LOW QUALITY WATER: A CASE FROM JORDAN

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## Abstract

The agricultural products in Jordan are being irrigated by different qualities of water, i.e. treated water, mixed water or high quality water. The cost of these qualities are different, from the farmer side, he wants to decrease the cost of production and increase his profit so he uses the water with the lowest cost, and the consumer prefers to buy a good quality of products with the lowest price. The use of low quality water for irrigation, the consumer's response and his acceptance of the products that has been irrigated by this water should be studied, in rural or urban areas.

This paper focuses on the Socio- economic features of the consumer's reaction of farm products irrigated with low quality of water, and then to quantify consumer preferences and perception for this water in rural and urban areas in Jordan. The consumer's knowledge of the effect of low quality irrigation water, his willingness to pay according to the quality and his preferences of different qualities, are being analysed. This analysis was in three different markets in Jordan; two are rural markets and the third one is urban market.

The main results in this study are that the consumer's acceptance and his knowledge about low quality water for irrigation and its effect on the products are different from one market to another and for one product to another. The good quality and low price of products, which have been irrigated with low quality of water, will increase the acceptance of these products by consumers.

Key words: Consumers, Low quality of water

## 1.Objectives

In the last few years the water problems in Jordan were increased and the use of treated water for irrigation started. The interest in wastewater treatment increased as a reliable source of water due to the population growth (Bataineh, 2000) and as a solution of the environmental problems caused by the flowing of the wastewater (The higher council, 1994).

There are many treatment plants in Jordan, but the biggest one is As-samra treatment plant. This is the third largest wastewater treatment plant in the world and receives all of the wastewater from Amman and environs (BGS, 1998). It contributes approximately 75% of the wastewater generated in Jordan (Doppler, 2001). The volume of wastewater flowing to this treatment plant in 1998 was 168857 m<sup>3</sup>/day (JWA, 1998). The treated water is being used for irrigation near this treatment plant. This water flows to king Talal dam (about 42 km downstream) and mixes with water from Zarqa River. The water from this dam is being used for irrigation in Dier Alla (middle of Jordan valley)(Doppler, 2001).

In the last few years the shortage in fresh water in urban and rural areas in Jordan was increased. To solve this problem, high quality of water for irrigation should be decreased and reallocate the high quality water in different sectors. It means the using of treated water for irrigation will increase especially that the volume of water for irrigation is three times more

than the one used for other purposes (Al-Shreideh, 1999). In this case the consumer response and his acceptance of these products, which have been irrigated with this water, should be studied. And also where is the acceptance of these products more, in rural or urban areas? There are many priorities for the consumer in buying the products. The priorities and the acceptance of the quality are different from one person to another and from one area to another.

This paper focuses on the Socio- economic features of the consumer's reaction on farm products irrigated with low quality of water, and then to quantify consumer preferences and perception for this water in rural and urban areas in Jordan. It aims also to know the opinion of the consumer about the effect of this water on different products and how far the price and the quality of products affect the increase of the acceptance of these products by the consumer in different markets. To reach these aims the following parts are being analysed:

- Consumer's Knowledge of the effect of low quality irrigation water.
- Consumer's willingness to pay according to quality.
- Consumer's preferences of different qualities.

## **2. Selection of the markets and consumers**

In Jordan the differences between the rural and the urban areas in some services are very high, for example 65.7% of the families in the urban areas are using public system for water sewage but in rural areas only 3.3% of the families are using the public system (GSD, 1996). This Paper focuses on the consumers' perception in different rural and urban markets for using this water for many different Products. Five are vegetable products and the other five are fruits. To choose these products many factors have been taken into account, like the variation of the products; in vegetables some of them are directly eaten without cooking process like watermelon or cucumber. Other products can be cooked or eaten directly like tomato. Others are eaten after cooking like potato. Other factor is the quality of the products, especially in the last years the quality of some products became worse than the past like watermelon, in this case it will be helpful to understand if the consumer knows the reason behind the bad quality or not. In the case of fruits the qualities of water, which are being used, have been taken in the consideration in choosing the products. Olive trees are irrigated by treated water in some areas, apples depend mainly on the rainfall, in the case of banana most of it depends on the high quality water. These different qualities of water in irrigation make it easier to understand whether the consumer really recognizes the products, which are being irrigated with different quality of water, or not.

The survey for 125 consumers has been done in three different areas; these are:

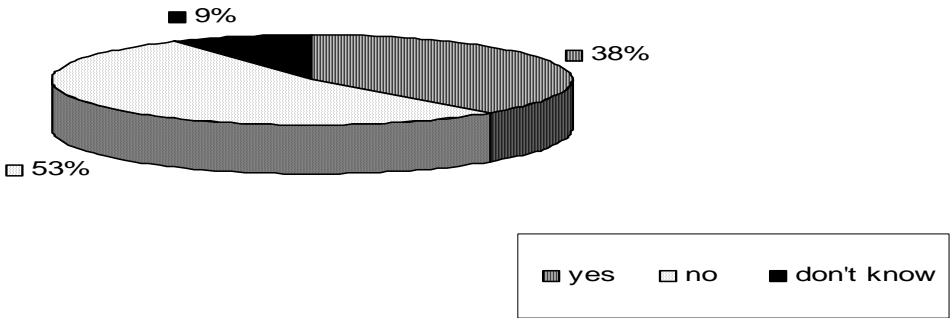
- 1) In Amman city as an urban market. The survey was in three main markets, east, middle and west Amman with three different levels of income. In each market 25 consumers have been interviewed. These markets are far from any of treatment plant, and the agricultural activities are not the main economic activity.
- 2) In Dier Alla as a rural market, 25 consumers have been interviewed. This area is an agricultural production area in the middle of Jordan valley. They are using the mixed water from king Talal dam and high quality water from king Abdallah Channel for irrigation.
- 3) In Al-hashemeiah market as a rural market but near As-Samra treatment plant, 25 consumers have been interviewed.

## **3. Consumer's Knowledge of the effect of low quality irrigation water**

The first question should be understood referring to this analysis that if the consumer think there is any effect of this water on the quality of products or not or he doesn't know. If there was an effect, is it different from one product to another? The most important point here also,

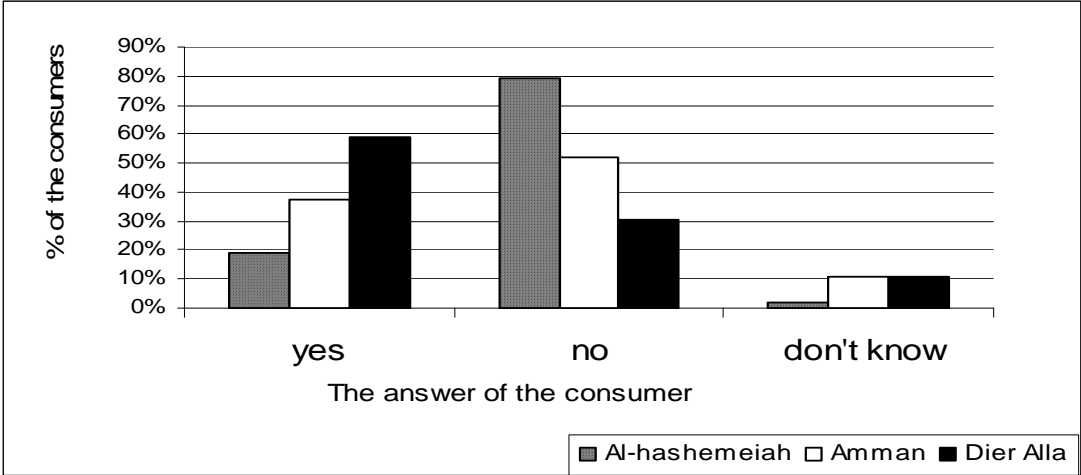
is there difference between the opinions of the consumers in different markets? The answers of these questions will be helpful to know which products the consumer will accept if this water is being used for it. At the same time in which market will he accept it more than the others.

Figure 1, shows the percentage of consumers, they think that the treated water affects or doesn't affect the quality of products and the percentage of consumers they don't know, for all products in all markets of the study. From this figure it is clear the highest percentage of consumers (53%) think that the treated water doesn't affect the products, 38% of consumers think that the treated water affects and the lowest percent of consumers (9%) don't have the knowledge.



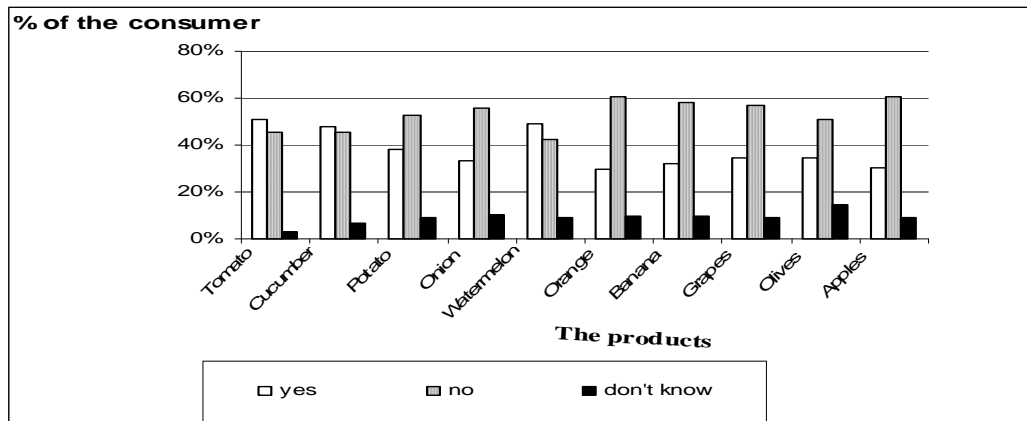
**Figure 1: The opinion of the consumer about the effect of treated water on the products in the markets of the study, Jordan, 2000**

Figure 2 shows a comparison of the consumer's opinion in each of the three markets, the lowest percent of consumers think that the treated water affects products (about 19%) is in Al-hashemeiah which is near the treatment plant and the highest one is in Dier Alla (59%). Also the lowest percent for the answer (don't know) is in Al-Hashemeiah. It means the people they are living near the treatment plant have the knowledge of the effect of treated water more than the other people in other markets and at the same time they think the effect of this water is not very high comparing with the consumers in other markets.



**Figure 2: The opinion of the consumer about the effect of treated water on the products in each market of the study; Jordan, 2000**

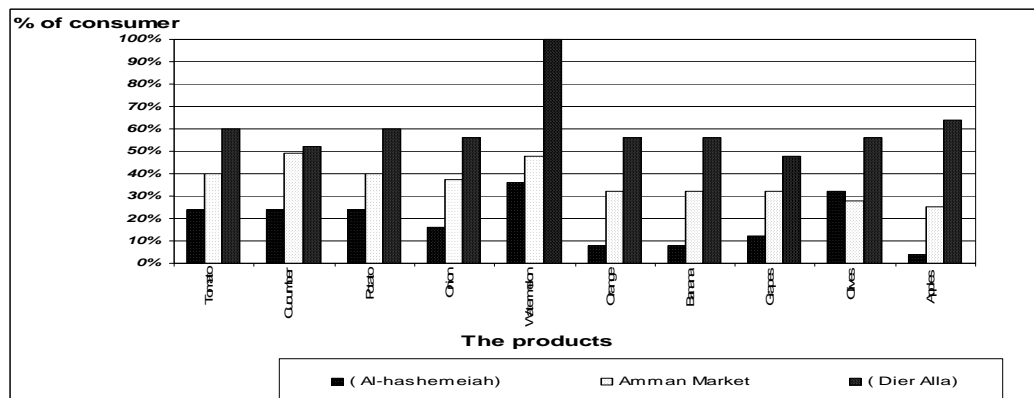
Figure 3 a comparison of the consumer's opinion about the effect of treated water on each product in all markets of the study. In this figure high percent of the consumers think that the treated water affects quality of tomato, cucumber and watermelon (about 50%). The lowest knowledge of the consumer (the highest percent of the answer – don't know-) about the effect of treated water on the products is for olives, although the olive orchards are allowed to be irrigated by treated water in Jordan and in the area near Al-samra treatment plant is already using this water for olive.



**Figure 3: The opinion of the consumer about the effect of treated water on for each product, in all markets of the study, Jordan, 2000**

Figure 4 shows the percent of consumers think that treated water affects the products for each product in each market of the study. It is clear that the lowest percents are in AL-hasheimeiah market for all products. In Amman market the percents in most of products are more than these percents in Al-hashemeaih and less than that in Dier Alla. It means that the consumers near the treatment plant think that this water is not very bad because many of them are working in agriculture and they are already using this water. In Dier Alla, which is considered as an agricultural area, have the highest percent, although the farmers in this area are using only the high quality and mixed water.

In the three markets the consumers think that the treated water affects the vegetable products (the first five products) more than the fruits. The percent in case of watermelon is very high in all markets. The reason behind that is the quality of watermelon, which became in the last few years worse than the past. We can conclude here that the consumers can not recognize exactly which products are affected by the treated water but when they find low quality of products in the markets they think it is caused by the quality of water, from bad use of chemical, hormones or others but they are not sure.



**Figure 4: The % of the consumers think that the treated water affects the products for each product in each market of the study in Jordan, 2000**

#### **4.Consumer's willingness to pay according to quality**

In applying any policies which related to using the treated water for products, it is important to know which product is more important in the pattern of food for the consumer than the others. But it is not easy to know which product is more important if we ask directly because in this case the consumer won't answer from his daily life, but his answer might be influenced by something he heard or seen about the importance of a specific product. Also it is important to know if the consumer would pay more to get the products that have been irrigated with high quality of water and for which products. The willingness to pay more means they think that water affect on this product and they need a good quality of these products.

In this study two criteria to measure the importance of the products for the consumer in his pattern of food have been used. The first one is the quantity in (kg) for each product that he buys per week and then calculate how much he buys per year divided by the number of his family members to know how much the consumption per person in the year. In this case as this value increases the importance of this product in his food pattern will increase. The other criterion is the amount he spends per year for each product, as a percent of the total expenditure for other products. This factor is important to put any policy related to the price of the products in case of classification of the products referring to the quality of water.

The tables (1a, b and c) show the average and the standard division of consumption in (kg) for each product per person per year, also these show the average and the standard division of spending money for each product by the family in the year and the percentage of this expenditure for each product referring to the total expenditure in all products of the study. The last two columns in these tables show how much the consumer will pay more for a product that has been irrigated with high quality water.

The Tomato product is the first product in all markets referring to the quantity of consumption per person in the year and in the same time it occupies one of the highest percent in the expenditure in all markets. It means that this product is very important in the pattern of food for the people in these areas.

In general the tomato, cucumber and potato have the highest quantity in consumption and also the highest value in the percent of expenditure, these products are almost used daily by the consumers because these are daily food in Jordan but the others like fruits are not used daily. This importance of products should be taken in to account when any policy is planned in using the treated water.

The willingness of consumer to pay more for products that have been irrigated by high quality water is more for the vegetables in all markets. In AL-Hasheimeiah market they would pay more for tomato, cucumber, and onion but for fruits (except the apples) they would pay less than the average price (minus) for high quality of water.

The question now is for which products will the consumer pay more than the average price? If he consumes more of one product than the others will he pay more to get a good quality of it? In any policy it must take under consideration the needing of one product by the people, if they consume more they need more and they prefer a good quality and refuse the treated water for these products more than the other products. In this case the people also may have the willingness to pay more for the products that irrigated with high quality water. The correlation coefficient between the quantity of consumption per year and the willingness to pay more was being calculated. This factor gives an idea about the differences between the consumers in the different markets. These are 0.37 in Al-Hahemeiahh 0,67 for Amman and 0.69 in dier Alla. It means that the consumer would pay more for the products that he consumes more to get a good quality. This means that he also think the treated water has an effect on these products. In Al-hashemeih is the lowest value of correlation that means they think that the water doesn't affect highly on these products. They will accept products that

irrigated with treated water than to pay more for the high quality water comparing with other markets.

**Table 1a: The quantity and the value of consumption of the different products, and the willingness of the consumer to pay for the products that have been irrigated by high**

The products	Consumption kg/person/ year	S.D	The value JD/ year	S.D	Expenditure (%)	Willingness to pay more as % of the average price	S.D
Tomato	47,0	21,6	66,5	37,6	17%	15%	0,45
Potato	33,3	26,1	67,2	55,5	17%	-2%	0,28
Water melon	29,7	19,3	37,1	33,7	9%	13%	0,31
Cucumber	27,2	17,6	12	33,5	12%	7%	0,40
Onion	17,9	16,2	19,1	12,3	5%	16%	0,39
Apples	14,5	8,2	41,7	17,2	11%	21%	1,13
Orange	14,2	9,3	34,6	16,7	9%	-11%	0,29
Grapes	10,3	5,4	28,1	20,9	7%	-2%	0,26
Banana	10,2	6,8	37,9	23,4	10%	-8%	0,23
Olives	5,0	3,6	15,4	10,2	4%	3%	0,30
Total			393,6		100%		

**quality water, in Al-hashemeiah market, Jordan, 2000**

S.D: standard division, JD: Jordan Dinner

Correlation coefficient between the quantity (kg/person/year) and the ability to pay more=0,37

**Table 1b: The quantity and the value of consumption of different products, and the willingness of the consumer to pay for the products that have been irrigated by high quality water, in Amman market, Jordan, 2000**

The products	Consumption kg/person/ year	S.D	The value JD/ year	S.D	Expenditure (%)	Willingness to pay more as % than the average	S.D
Tomato	48,0	26,3	76,3	77,7	16%	27%	0,67
Potato	40,6	22,7	76,4	53,7	16%	13%	0,25
Water melon	35,3	25,7	47,3	46,3	10%	15%	0,51
Cucumber	31,6	18,4	52,7	34,6	11%	11%	0,32
Onion	23,7	17,8	30,9	21,8	6%	15%	0,36
Apples	21,1	16,1	65,5	42,0	13%	3%	0,26
Orange	17,2	12,8	45,5	37,0	9%	7%	0,27
Banana	16,8	17,0	51,4	44,1	11%	3%	0,24
Grapes	11,0	8,1	30,3	27,1	6%	7%	0,32
Olives	3,7	3,5	10,1	11,8	2%	13%	0,40
Total			486,4		100%		

S.D: standard division, JD: Jordan Dinner

Correlation coefficient between the quantity (kg/person/year) and the ability to pay more=0,67

**Table1c: The quantity and the value of consumption of different products, and the willingness of the consumer to pay more for the products that have been irrigated by high quality water, in Dier Alla market, Jordan, 2000**

The products	Consumption kg/person/year	S.D	The value JD/year	S.D	Expenditure (%)	Willingness to pay more as % than the average price	S.D
Tomato	63,8	24,2	165,6	129,3	23%	22%	0,62
Potato	43,1	27,7	119,9	68,7	17%	12%	0,30
Water melon	33,4	30,3	57,2	44,2	8%	6%	0,39
Onion	29,9	27,7	55,3	47,8	8%	9%	0,27
Cucumber	29,8	16,9	100,5	131,9	14%	20%	0,41
Orange	15,6	19,0	52,0	49,0	7%	1%	0,20
Apples	14,1	11,7	72,2	52,0	10%	8%	0,31
Banana	11,4	9,3	48,2	25,2	7%	3%	0,20
Grapes	10,1	9,9	33,5	31,5	5%	11%	0,44
Olives	5,0	3,9	18,7	10,3	3%	6%	0,18
Total			723,0		100%		

S.D: standard division, JD: Jordan Dinner

Correlation coefficient between the quantity (kg/person/year) and the ability to pay more=0.69

## 5. Consumer's preferences for different qualities

Most consumers prefer the products that have been irrigated with high quality water in all markets. There are two main reasons for this preference as it shows in table.2; the first one is the health reason (about 44%-80% of the consumers prefer it because of this reason in different markets). Many of consumers think that the treated water is not good for irrigation and then if it is used it will affect the human health. The second reason is the ethic issue (about 31%-56% of the consumers prefer it because of this reason in different markets) many people don't like this water only because it is treated water even it is very good quality.

**Table 2: The reason of consumer' preference the products that have been irrigated with high quality of water, Jordan, 2000**

The area \ The reason	Al-hashemeiah	Amman	Dier Alla
Prefer high quality water	96%	91%	92%
Healthy reasons	44%	69%	80%
Ethic issues	56%	31%	48%
Taste is better	0%	16%	32%
Others	0%	3%	0%

Note: more than one answer is possible

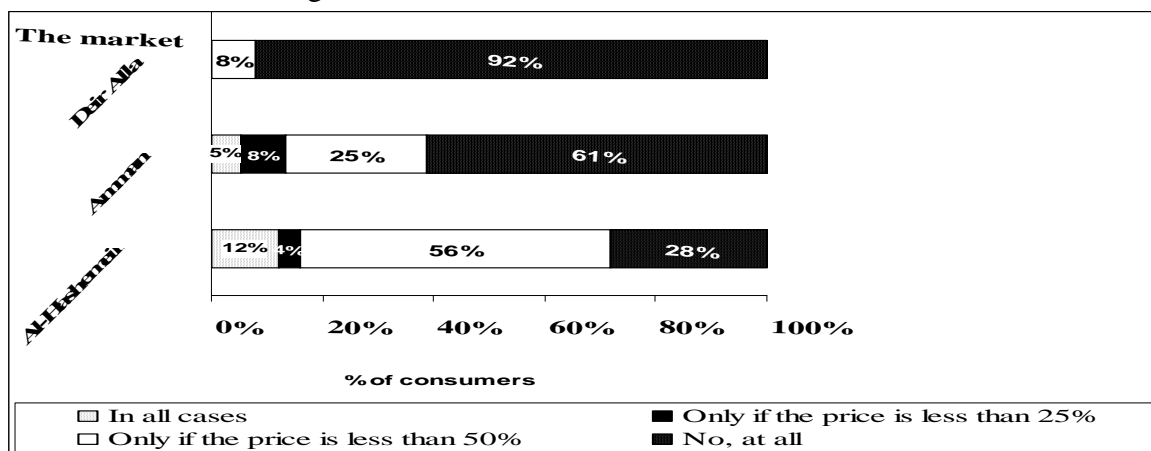
In the last discussions of the opinion of the consumer we can understand that the acceptance of the products are not the same. Also it is clear that the consumer has the ability to pay more for some products to be sure that these were irrigated with high quality water but it is not the same for all products in different markets.

Now it is useful to know how will he accept this water for products? If the quality of products irrigated with different quality of water is the same, will he accept it? How far the price affect

on his opinion to make him accept this water? If the price of the products is different referring to the quality of water; the products, which have been irrigated with low quality of water, are lower than the same products that have been irrigated with high quality of water, will the consumer buy these products? How much the difference in the prices should be to make him accept it?

There are two scenarios; the first one if the quality of products is different. The qualities of products, which have been irrigated by treated water, are worse than the ones irrigated by high quality of water. The second one if the qualities of products are the same.

Figure 5 shows the percent of consumers who accept the products that have been irrigated by treated water in different markets, if the quality of these products is worse than the others. The analysis here contains four different cases, the first case to accept it, no matter how much the differences of the prices. It means in this case the consumer doesn't think about the quality of the products he wants only to find what he wants. The acceptances in this case are very low and in some markets like in Dier Alla is zero. In the area that they are already using this water for irrigation (Al-Hashemeieh) 12% of the consumers don't mind the quality of products. The second case is if the price of products that have been irrigated with this water is 25% less than the same products that have been irrigated with high quality of water. The third case if the differences between the prices is 50%. The acceptance of these kinds of products is increasing as the differences in the prices are increasing. From this graph in Dier Alla the acceptance is very low (8%) even the differences of price is 50%, the people in this area think this water will affect negatively on the products, but in Al-hashemeiah the acceptance is very high- especially if the difference of the price is very high-reaching more than 56%. The fourth case, the consumer will not accept these kinds of products no matter how much the difference in the price is. In this case the highest is in the Dier Alla and the lowest in Al-hashemeiah.



**Figure 5: Consumer's acceptance of the products, which have been irrigated with treated water, if the quality of products worse than the others in the markets of the study, Jordan 2000**

The scenario now if the qualities of the products are the same, it means there is no negative effect from the water on the products, will the consumer accept these products. This case will be discussed referring to the Figure 6 in four different situations of the prices. The first one, the acceptance of this water no matter of the differences in the price between the products, in this case the acceptance in the Dier alla market is the lowest one (8%) and the highest one is in Al-hashemeiah market.

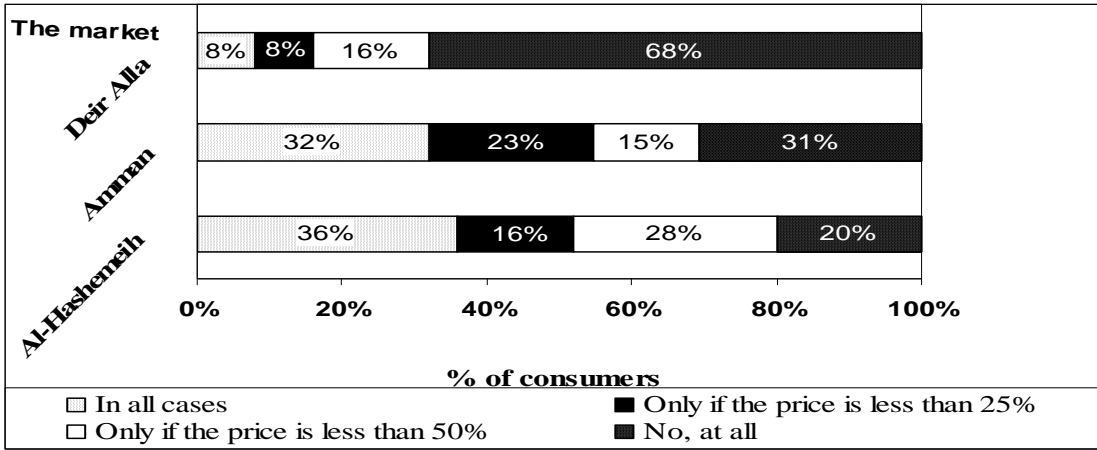
The second and the third cases are if the prices are 25% and 50% more than the prices of the same products but the qualities of irrigated water, which has been used, are different. As the differences in the prices are increasing the acceptances are also increasing in Dier Alla (if the



difference is 25% in the price the acceptance is 8% if the difference is 50% in the price the acceptance is 16% more than the first level) and in Al-hashemeiah (16%, 28%) it means the increasing in this acceptance is increasing in an increasingly way. But in Amman as the difference of the price is increasing the acceptance is increasing but in a decreasingly way. The flexibility of the consumer to accept this water in Amman is more than the other areas because as the difference of the price is increasing 25% the acceptance is increasing 23% but in other markets the acceptances are increasing 8% and 16% for the same case.

The fourth case that the people refuse to buy these products no matter of the difference in the price. The highest one in this case is in Dier Alla, (68%) and the lowest one is in the Al-hashemeiah (20%).

From the previous discussion, it is clear that many of consumer prefer the products which have been irrigated with high quality of water but in the same time they have the flexibility to accept treated water in different cases like if the price of the products are lower than the others, or if there are no difference in the quality, but these acceptance is different from one market to another, at the same time from one product to other. The highest acceptances for all cases are in the area where they are using this water. In urban area they have the flexibility to buy these products more than the other areas.



**Figure 6: Consumer’s acceptance of the products, which have been irrigated with treated water, if the quality is same to that one for other products in the markets of the study, Jordan 2000**

**6.The results and the conclusions**

The consumer has his own knowledge of the effect of low quality water on the products. The consumer’s knowledge and his acceptance of the low quality irrigation water are different for one product to another and from one market to another. The people are living near the treatment plant have the knowledge of the effect of treated water more than the other people in other markets and at the same time they think the effect of these water is not very high comparing with the consumers in other markets like in Dier Alla, which is considered as an agricultural area and the farmers in this area are using only the high quality and mixed water. The consumers cannot recognize exactly the effect of treated water on products, but when they find low quality of products in the markets like in case of watermelon in Jordan they think it is caused by the quality of water, although this water has been not used for this product. The consumer would pay more for the products that he consumes more to get them irrigated by high quality water. This means that he also think the treated water affects these products. The consumers in all markets prefer the high quality irrigation water. There are two main reasons for this preference the first one is the health reason and the second one is the ethic issue.

The price and the quality of products affect on his opinion to accept low quality irrigation water. As the quality becomes better the acceptance will increase and when the price becomes lower the acceptances increase.

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