

## 10. Perceptions of stakeholders

*This chapter presents perceptions of vegetable farmers, sellers of exotic vegetables, consumers of such vegetables and local authorities/officials on urban open-space vegetable farming and irrigation with polluted water sources in Ghana. In all, over 1000 vegetable consumers, 150 vegetable sellers, 24 city officials and over 140 farmers took part in the study in Accra, Kumasi and Tamale. It also presents Accra's first Vision on urban and peri-urban agriculture.*

### 10.1 Data collection

When dealing with wastewater irrigated vegetable production, the manner in which different stakeholders perceive it (or not) provides important insights on their priorities and motivation to deal with these issues. In a typical farming situation in urban Ghana, the key stakeholders involved are the farmers and their families, the market sellers who earn an indirect living from the sale of the produce, the consumers who may or may not be aware of the source of their consumables, the local authorities/officials who have the responsibility of regulating the practice, especially if polluted water sources are used, and the media with the power to influence opinions. Assessing their views and perceptions is a sensitive exercise.

Data used in this study were collected mainly through field interview with 1100 vegetable consumers (400 each in Accra and Kumasi and 300 in Tamale) and 150 vegetable sellers (50 each in Accra, Kumasi and Tamale) using semi-structured questionnaires. Consumers were sampled on suburb basis to cover an entire city with all the different social and economic groups. Only sellers of exotic vegetables (e.g. lettuce, cabbage, carrot, cucumber, and green pepper) were interviewed, as the vegetables they sell are the main ones grown in urban areas with irrigation. Sellers were chosen at random (affected by their willingness to participate) from selected markets (both big and small) spread across each city. Twenty-four city officials (15 in Accra, 5 in Kumasi and 4 in Tamale) were interviewed as part of this study. Information on farmers' perceptions was obtained from two separate complementary field surveys. In one survey, which focused on farmers' identification and ranking of farm constraints, 60 and 49 urban open-space vegetable farmers were interviewed in Accra and Kumasi respectively while in the other survey (focused on farmers' perceptions of urban agriculture and wastewater irrigation), 138 open-space vegetable farmers were interviewed in Accra.

## 10.2 Perceptions of farmers

### General farming constraints

In all the cities, farmers encounter numerous constraints in producing vegetables (Box 10.1).

**Box 10.1:** Typical production constraints mentioned by urban open-space farmers in Kumasi, Accra, Takoradi and Tamale

- Marketing of produce: vegetable market women/sellers dictate produce prices at harvest.
- High cost of input (pesticides, farm tools, labor, fertilizer, etc.)
- Pest and disease threats to crops
- Inadequate amount of cheap soil inputs (compost, poultry manure, etc.)
- Lack of available land and tenure insecurity due to the increasing rate of urban development.
- High labor input (personal or paid) for watering of vegetables
- Dry-season access to (safe but cheap) water for irrigation
- Poor seed viability (lettuce, cauliflower, cabbage)
- Lack of capital funding sources: farmers have to fund themselves or make an arrangement with the market women to provide them with some advance payments for more production.
- Limited support by extension service (see chapter 11.2 for details)

Four of the constraints identified in the cities were labelled as more ‘important’. These were farming input, water, crop disease, and marketing. Table 10.1 shows the percentage of farmers in Accra and Kumasi that identified each constraint as important. Majority of the farmers mentioned input as an important constraint. Water was the next constraint identified by the majority in Accra as important while in Kumasi, crop disease was the next important constraint identified by nearly half of the farmers.

**Table 10.1:** Key constraint identified as important by farmers

Constraint	Accra (%)	Kumasi (%)
Marketing	42	35
Input *	82	69
Water	75	53
Crop disease	48	55

\*Seeds, fertilizer/manure, tools

Farmers specified the nature of each constraint as shown in Table 10.2. More than half (56%) of the farmers in Accra mentioned water shortage between December and March as the main problem associated with the available irrigation water sources. This was followed by water cost (24%) and quality (22%). Exceptionally for Accra, 11% of the farmers indicated that ‘public criticism’ of the sources of water they use for irrigation is the factor that makes water a constraint to urban vegetable production. In Kumasi, ‘lack of adequate supply’ throughout the year and dry season shortage were the main problems of irrigation water. Regarding input, between 47 and 68% of farmers in the two cities complained of cost as the main factor, which makes it a constraint, followed by the quality of seeds available. On marketing of produce, 59% of farmers in Kumasi specified the exact problem as ‘low seasonal demand’ while 32% of farmers in Accra labelled the problem as ‘no direct market access/cheap pricing of produce.’ More than two-thirds of respondents in each city indicated that crop disease more often than not results in crop damage (or failure). This, they have tried to avoid by using various known chemicals (such as Lindane, Chlorpyrifos, Endosulfan, etc.) as well as local soap and other products, but have not succeeded.

**Table 10.2:** Specification of nature of ‘important constraints’

Nature of constraint	Water (%)		Input (%)		Marketing (%)		Crop disease (%)	
	Accra	Kumasi	Accra	Kumasi	Accra	Kumasi	Accra	Kumasi
Lack of adequate supply	2	45						
Public criticism	11	0						
Conveyance	2	31						
Quality	22	0	20	26				
Cost	24	8	47	68				
Shortage	56	42	6	0				
Viability of seeds/expired chemicals			27	20				
Lack of tools and equipment			12	0				
Seasonal low demand					28	59		
No direct market access/cheaper pricing of produce					32	29		
Yield reduction							31	22
Crop damage					12	18	69	78

The results of the average ranking of constraints to irrigated vegetable farming and the degree of importance of each constraint to all others are presented in detail in Table 10.3. None of the constraints was ranked on average as ‘most important’ in both cities. In Accra, water and input were ranked the same, as very important constraints but in Kumasi with easier water access in inland valleys, farmers ranked these two as only important. Crop disease and marketing were both ranked as important constraints in the two cities. Soil fertility, land, credit/capital, lack of extension services, crop theft, labor, etc., were all ranked as ‘less important’ in both cities. Regression analyses of the influence of education, experience (years cultivating), irrigation water source and type of land tenure on the mean ranking of constraints were done, but did not result in statistically significant ( $p < 0.05$ ) relations.

**Table 10.3:** Ranking of constraints to irrigated urban vegetable farming

Constraint	Mean Ranking	
	Accra	Kumasi
Input	2.27	2.59
Water	2.27	2.99
Crop disease	2.87	2.80
Marketing	3.43	3.39
Credit/capital	3.80	3.61
Soil fertility	3.85	3.71
Land	3.87	4.00
Crop theft	3.90	3.84
Lack of extension services	3.97	3.39
Expired chemicals	3.97	4.00
Labor	4.00	3.76

Scale 1 to 4: 1=most important; 4 =less important

### Irrigation water source

About two-thirds (65%) of the 138 farmers interviewed in Accra expressed satisfaction with the sources of water they use. Their reasons for using such water were due to the many benefits they derived from the water. For such farmers, wastewater/urban runoff provide reliable water supply because flow is relatively continuous (mentioned by 36% of the farmers) and they do not pay for the water as some of the other farmers do, who are using costly pipe

borne water (32% mentioned this). This in addition is often in short supply thereby making it an unreliable source. Less than 5% of farmers referred to nutrients in water as reason for its use; but generally, farmers do not give consideration to the nutrients present in wastewater. They use it mainly as a dry-season source of water, and apply poultry manure as a (often free) source of crop nutrients.

Ten percentage of the 138 farmers mentioned skin irritation/diseases and bad odor as the health risks associated with the use of their irrigation water. Majority of the remaining farmers (71%) were of the opinion that there has never been any actual risk to themselves or to the consumers. This is how many of them put it:

*“Ever since I was born, my father has been doing this work [farming] and it is the same drain water [wastewater] we have been using with no health problem...”*

Similarly, in Kumasi, Keraita (2002) reported that only few farmers complained of having e.g. body rashes from the use of irrigation water. Their confidence in the low levels of risk also derived from no complaints coming from the consumers of their products:

*“There is nothing wrong with the water [drain water]. Nobody [consumer] has ever complained of any disease after eating our vegetables”*

The rest (19%) hold dual opinions on the health issue. They indicated that they have not encountered any actual problems for themselves, and believe it is the same for the consumers. However, they also hold the opinion that the use of “wastewater” might potentially be associated with some diseases due to the presence of germs in the water and this might show up later on.

The low risk perception has to be understood in the context of farmers and consumers where both might have experienced from childhood other health affecting factors as poor sanitation, unreliable supply of potable water, daily malaria threat etc. To emphasize in this context a single factor is difficult and actual risk perception is likely to be very low.

In Accra, 19% of the farmers wear temporarily protective clothing, mainly boots and hand gloves, when irrigating or applying manure while 14% perceive that the use of protective clothing particularly boots retard work progress on the farm and that they work faster without such clothing. In Kumasi, 80% of the 71 farmers interviewed by Keraita (2002) were aware that wastewater had pathogens. However, the awareness was “passive” and did not result in the use of protective measures.

### 10.3 Perceptions of vegetable sellers

#### Knowledge about source of vegetables

Sellers have different mechanisms for sourcing their produce. Some of them select their crops on the field and even harvest themselves, while others buy at distribution points where the source may not be known. In all, over 85% of the exotic vegetable sellers interviewed in each city were aware that their vegetables are produced from within the cities they live in.

#### Benefits and problems of urban vegetable farming

Over two-thirds of the 50 vegetable sellers in each city mentioned the following as benefits of urban open-space vegetable farming (in no particular order):

- employment for farmers and sellers;
- easy access to fresh vegetables;
- reduced cost and time of transportation for sellers and;
- usually lower prices of vegetables (since transport costs are less);
- increased supply of vegetables on city markets (because of easy access);
- high profit through high turnover; and
- ability to supplement their family food (in case of traditional vegetables);

As a result of these advantages, sellers were supportive of agriculture within cities, and mentioned that city authorities should give it more attention.

Half of the sellers interviewed in Accra<sup>1</sup> and 8% in Tamale were aware of possible health risks associated with urban vegetable farming. When asked (those aware of risks) to specify the risks in question, 96% of such sellers in Accra and 50% in Tamale identified irrigation with polluted drain water as the main risk. They mentioned that this could infect consumers with diseases (through contamination of vegetables) without their being able to specify what type of disease. In Kumasi, 10% of the sellers were aware that there were some health risks without being able to specify the nature of it.

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<sup>1</sup> This awareness might be a reaction to the fact that only in Accra the media targeted wastewater use followed by attempts of the authorities to prosecute farmers using polluted water for irrigation (see Drechsel et al., 2006a).

### **Quality of vegetables**

All sellers in Accra, Kumasi and Tamale are much concerned about the appearance of their produce, which includes its “quality”. Consumers buy only what looks proper, and anything short of this will mean loss of customers. However, “quality” of vegetables was in this context not associated with bacterial contamination levels. Vegetable sellers in all the three cities have common criteria for evaluating the quality of vegetables. This is mainly by observing and inspecting them. They look for the following: size, shape, freshness of leaves, color, firmness of leaves (particularly with cabbage), spots, dirt, holes, etc. Buyers use the same criteria (see below).

### **Sources of water and its influence on purchasing**

Over 70% of the sellers interviewed in each city were aware of the various sources of water being used by farmers cultivating vegetables in the cities. For the different cities the sources mentioned were the same as reported in the previous chapters. However, sellers were not specific about the quality of the various sources of water mentioned except for holding the general notion that pipe borne water has the best quality because it is treated water.

Between 20% and 50% of the sellers in the three cities said that they enquire about the geographical source of the crop. This was particularly so in Accra where 88% of the sellers indicated that sometimes consumers ask about the source of vegetables or the water used<sup>2</sup>. In Kumasi and Tamale, the situation is rather different with less than 20% of the sellers being sometimes asked about the source. Asking about the “source” is, however, not a direct indicator of risk awareness but can also be related to belief or experience that, for instance, carrots from Togo are better than those produced in Ghana without actually knowing the reason. In response to a direct question about what sellers think of vegetable production with “wastewater”, nearly all the sellers in the three cities replied as expected with negative opinions. According to them, this could bring diseases to consumers. Nearly 30% of sellers in Accra and Kumasi expressed the opinion that farmers involved in such practices should be stopped without any compromise.

When asked if they would offer higher price for vegetables produced with ‘good’ quality irrigation water (supposedly piped water), 76% of the respondents in Accra answered ‘Yes’, while only 14% and 28% in Kumasi and Tamale respectively, answered similarly. Sellers who were not willing to offer higher prices for vegetables grown with ‘good’ quality water

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<sup>2</sup> However, no seller would reveal that the source might be an inner-urban place known for its bad water quality.

indicated that in practice this would result in selling vegetables at higher prices without having a corresponding demand. This reply appears to be a more thoughtful one (see also Danso et al., 2002b). Most sellers also hold the view that it is difficult to distinguish between wastewater irrigated vegetables and those grown with clean water. From the survey, it was gathered that sellers (mainly in Accra) use physical characteristics to differentiate between wastewater-irrigated vegetables and those grown with good quality water. However, the characteristics given (“slightly yellowish leaves”, “generally not fresh”, etc.) did not appear reliable, considering that 90% of the perishable vegetables are produced with polluted water, and actually do not show these characteristics.

#### **10.4 Perceptions of consumers**

##### **Knowledge about source of vegetables**

Analysis of the survey results revealed that 60-94% of the consumers were aware that urban agriculture was a source of their vegetables (94% in Tamale, 80% in Accra and under 60% in Kumasi). Awareness is higher in Accra and Tamale than in Kumasi because in Accra and Tamale vegetable farming is done mostly in the core areas of the city, close to urban dwellings while in Kumasi many of the vegetable farms are located at the fringe around the local university.

##### **Benefits and problems of urban vegetable farming**

Like vegetable sellers, consumers have a similar perception of benefits and potential problems of urban vegetable farming in Ghana. New arguments among the benefits were soil protection and savings in vegetable import and foreign currency. Also the risk perception was similar pointing at the possibility of diseases from the use of polluted water. Consumers also mentioned that some urban farmers use agro-chemicals wrongly, which could also have health implications.

On the question of how urban agriculture could be better organised, given the benefits mentioned, some of the consumers suggested that part of government lands should be set aside specifically for vegetable farming in the cities. They further mentioned that additional lands could be acquired in the peri-urban areas through negotiations with traditional authorities and farmers could pay a token fee to landowners.

### **Quality of vegetables**

The study revealed that a large majority of the consumers interviewed in each of the three cities are naturally concerned about the quality of the food they buy, including vegetables. Like with vegetable sellers, consumers also usually use standard characteristics such as color (greenish leaves represent good quality and yellowish represent bad quality), shape, cleanliness, freshness, no spots etc. to determine produce quality. The discussion held with sellers concerned the price, not the origin of the produce or the use of bad irrigation water or pesticides. Anyhow, it would be difficult to distinguish between likely contaminated and uncontaminated crops, and more than questionable if the seller would reveal any source which could reduce the market value of the crop.

### **Sources of water and its influence on purchasing**

Though the criteria for determining crop “quality” do not include pathogen contamination, many consumers (45% in Accra, 40% in Kumasi and 58% in Tamale) – if directly asked - thought it important to know where the vegetables were produced in order to avoid contaminated ones. When asked if they would buy wastewater-irrigated vegetables if they had a choice, 75-96% answered in the negative. Like sellers, consumers mentioned the contracting of diseases as the reason why they would not buy wastewater-irrigated vegetables. Others, however, were of the opinion that wastewater-irrigated vegetables could be cleaned adequately to remove any disease-causing organism. Consumers’ reactions as to what they would do in a scenario where all vegetables on urban markets were grown with wastewater were analysed too. Nearly 40% of the respondents in Tamale said they would clean vegetables adequately and use them instead of avoiding them. At least 30% would either cultivate vegetables themselves or buy from rural areas. Between 60 and 80% of the respondents in Accra and Kumasi pointed out that they would prefer stop buying vegetables from the market, though they could not point out where they would go for safer vegetables. About 20 to 40% mentioned that they would adequately clean such vegetables.

### **Cleaning of vegetables**

Cleaning vegetables at home is common. In a survey reported by Amoah et al. (2006b) over 90% of the consumers in Kumasi, Tamale and Accra said that they wash purchased vegetables at home. However, the survey also showed that the methods vary widely (Table 10.4) and are not very effective.

**Table 10.4:** Common methods used by consumers to clean vegetables (Amoah, unpubl.)

Cleaning Method	% Respondents		
	Accra	Kumasi	Tamale
Washing with warm water in a bowl	55	53	51
Washing with salty water in a bowl	34	34	14
Washing with salty water and vinegar or potassium permanganate in a bowl	6	11	10
Washing with water and vinegar in a bowl	4	1	2
Washing twice with tap water or with water in a bowl	1	1	23

### 10.5 Perceptions of city officials

Generally, agriculture in Ghanaian cities is at least theoretically recognized as there are bylaws regulating the types and number of crops and animals that could be cultivated or raised (Ghana Local Government Bulletin, 1995). Though the bylaws do not specifically promote urban farming, they do recognize (the possibility of) its existence and seek to control it in order to maintain good sanitary conditions in the city (see Chapter 11).

Moreover, both the National and Local Governments (District Assemblies) have shown their recognition of urban open-space farming in two ways:

- Under the decentralization policy of the Ministry of Food and Agriculture, a Food and Agriculture Directorate for the Accra district was established, which is responsible for the metropolitan level. The Directorate has its own extension staff in charge of open-space farming in the city.
- Throughout the country, best district, regional and national farmers are annually rewarded (Figure 10.1), including those at the metropolitan level labelled as the “Best Urban Farmer” or “Best Metro Farmer” (Annang and Drechsel, 2005).

However, as the following chapter and many other studies have pointed out for West Africa and Ghana in particular, official recognition of urban agriculture has not been reflected in city planning and development (Obosu-Mensah 1999; Drechsel et al., 2006a). The planning of most Ghanaian cities is based on a master plan designed originally by colonial administrators, which does not consider urban farming, although the practice of inner-urban vegetable production dates probably back to the start of the first European forts and castles in the 16<sup>th</sup> century (Anyane, 1963).



Figure 10.1: Martin Kumah of Ghana during the award ceremony on National Farmers' Day, 2004. In 1998, Martin was the Best Urban Farmer (Kumasi), in 1999, the Best Regional Aquaculture Farmer (Ashanti Region), and in 2002, the Best National Aquaculture Farmer. In 2004, he received the award for the first runner up in the most prestigious 'Best National Farmer' contest (Annang and Drechsel 2005; Photo: Courtesy M. Kumah).

The officials interviewed in this study acknowledge unanimously the importance of urban agriculture in providing food and jobs for unemployed urban dwellers and preventing encroachment of both government and private lands. They also believe that vegetable production in and around Ghanaian cities contributes to the supply of vegetables, which improves the nutritional level of urban diets. However, in all cities, concerns were expressed that without proper monitoring urban agriculture compromises the health of city dwellers. These officials complained about possible crop contamination from two sources: untreated wastewater and inappropriate use of agro-chemicals.

### 10.6 Perception of the Government

In Ghana and Nigeria, urban [backyard] gardening was indirectly encouraged in the seventies through programs like "Operation Feed Yourself" and "Feed the Nation", launched by the respective governments. Despite several projects funded in the meantime, for example, by FAO, DFID and IDRC on urban food supply, the peri-urban interface, etc., urban farming did not receive much political attention. Due to recent efforts from the Resource Centres on Urban Agriculture and Food Security (RUAF) a first national policy seminar on Urban and Peri-urban Agriculture was organized in 2005 as a follow-up to a corresponding Multi-stakeholders Forum. The policy seminar was co-organized by the Ministry of Food and Agriculture (MoFA), the Science and Technology Policy Research Institute of the Council for Scientific and Industrial Research (STEPRI-CSIR), the Food and Agriculture Organization of the United Nations (FAO) and the International Water Management Institute (IWMI). The Honorable Clement Eledi, Deputy Minister of Food and Agriculture, commented during the

seminar that urban and peri-urban agriculture is a reality that has come to stay contributing to household income and poverty reduction. However, it also requires strong leadership at both the local and national levels. The Minister promised that MoFA will ensure the provision of safe water for urban farmers and from 2006 on, MoFA would give an award to the *national* best urban and peri-urban farmer during the annual “Farmers Day” celebrations. The seminar closed with a joint statement on urban and peri-urban agriculture, reproduced in Box 10.2.

**Box 10.2**

*Statements of Vision on  
Urban and Peri-urban Agriculture (UPA) in Accra*

- UPA plays an important complementary role to rural agriculture in contributing to food security, employment and income generation, especially for the urban poor.
- While contributing to livelihoods and food security, it is recognized that UPA faces numerous challenges and constraints such as limited availability of land, access to safe water and other production resources, and market constraints.
- There is the need to overcome current and emerging challenges facing UPA by coordinating all stakeholders, streamlining its operations and creating an enabling environment for its sustainability
- As urban population soars, the role of UPA in supplying perishable food to cities of Africa becomes increasingly important and needs a supportive policy and legislative framework.
- Overcoming the challenge calls for the recognition of UPA in the sector ministries and agencies and for policies to effectively integrate UPA in urban planning and development.

*Statement of Consensus*

We call for the promotion of a shared vision on UPA that takes into account the specific needs and conditions in the country and urge Policy makers, in partnership with Development Partners, to develop gender sensitive policies and appropriate instruments that will create an enabling environment for integrating and supporting UPA into our economies

Endorsed on 13. 12. 2005 by the participants in the presence of Honourable Clement Eledi, Deputy Minister of Food and Agriculture

In 2005/6, IWMI and FAO assisted Ghana’s Irrigation Development Authority (GIDA) in developing the first *national irrigation policy* standing up for the recognition of the informal irrigation sector, including irrigated urban and peri-urban agriculture. The importance of this sector is highlighted by the case of peri-urban Kumasi, where about 12,000 ha are under informal dry-season vegetable production (Cornish and Lawrence, 2001), which is more than twice the area currently under formal irrigation in the whole of Ghana (see Chapter 2).

### 10.7 Perceptions and role of the media

Like in other low-income countries, public services in Ghana are constrained by a variety of factors and lack far behind their ambitions. In this situation, some media feel the obligation to point at problems the authorities should address. These ‘appeals’ are powerful instruments as they steer public perceptions of problems. Consequently, authorities give them whenever possible priority attention. Sanitation and waste are ‘hot’ issues in Ghana. Due to the use of polluted drain water, also irrigated urban vegetable production is frequently featured in TV and the printed media (Figure 10.2).



Figure 10.2: Irrigated urban agriculture in the press (Ghana’s Daily Graphic).

Figure 10.2 depicts the tension under which urban farmers have to operate in Accra, and the pressure on the authorities. Although some journalists and media focus solely on problems, there are increasingly others looking for constructive solutions. These could become a crucial stakeholder in sustaining risk-reduction programs. They could assist authorities and consumers in giving public attention to, for example, farmers using safer irrigation practices while putting pressure on those not using them.

### **10.8 Conclusions**

Urban irrigated vegetable farming in open-spaces in Ghana is confronted with numerous constraints in marketing, lack of input, low-quality water, credit/capital, crop disease, soil fertility, and crop theft. Of these constraints, farmers identified and ranked lack of input, water, crop disease and marketing, as most important constraints.

Farmers mentioned the importance of their water sources for continuous irrigation and income, but they do not wish to be openly associated with the low water quality, owing to the media and some public criticisms out of fear that such an association may possibly influence the sale of their produce and livelihoods. For themselves, they do not seem unduly concerned about water contact related health consequences, and also do not appear to believe in other problems, given that according to many of them, they have rarely received complaints about this aspect of the quality of vegetables they produce. Vegetable sellers and consumers seemed to recognize the need for urban open-space agriculture and its benefits to the society. They are generally concerned about the quality of the food they sell or buy, though the criteria of quality do not include contamination through polluted irrigation water.

The city officials recognized the contribution that irrigated vegetable production makes in terms of food supply to cities, but remain concerned about the irrigation water sources. Ghana's media nurtures these concerns. Though the authorities oppose wastewater irrigation, they tolerate the practice until now due to lack of resources to address the situation or to provide alternatives to the farmers. The officials felt that urban agriculture could be successfully encouraged if it were planned and regulated properly, with sound monitoring so as not to compromise the health and well being of city dwellers. Current efforts by RUAF started a related policy discussion, which resulted in a Vision statement endorsed by the Ministry of Food and Agriculture.

The levels of awareness shown by the stakeholders indicate that there is some degree of reflection about the practice currently. This is encouraging as it lays a fertile foundation to

improve negative perceptions in a constructive way, for example, by introducing options to reduce health risks related to wastewater use (see Chapter 12). Educational campaign could build on at least dormant risk awareness and the readiness of consumers to clean vegetables at home, although their practices will have to be improved. That the awareness is dormant and does not affect consumers' decision making during vegetable purchase has probably two different reasons:

- The specific risk factor might not have priority (as other risk factors take the attention, or as it is believed that the risk is under control).
- Health is in general a neglected incentive, like also consumption habits in the developed world show.

Awareness campaigns for consumers should be accompanied by the introduction of safer irrigation practices on farm. Currently there are two research projects of the CGIAR Challenge Program on Water and Food in Ghana (CP38 and CP51) exploring applied options for health risks reduction ([www.iwmi.cgiar.org/africa/west\\_africa](http://www.iwmi.cgiar.org/africa/west_africa)).

Farmers appear increasingly interested in practical innovation and are even ready to invest to avoid pressure from the authorities and media.