S1 Supporting Information

Appendix A. Irrigation water sample collection form

Irrigation Water Sample Coll	ection Form
Barcode/sample Id	ate / / / /
Ti	me
1. GPS latitude	ocation
2. GPS longitude D	escription
3. Location ID:	
4. What is the source of irrigation water colled	cted?
Drain Water Shallow V Channelled Stream/River Tube/Dee Dug-out/Pond Piped Water	
5. If "Yes", check box:	
Within 3m of trash? Within 3m of faeces? Within 30m of latrine or defaecation area?	eld Notes:
6. Physiochemical Characteristics Turbidity	ab notes:
Temperature	
Electrical conductivity	
7. At lab:	
Starting Volume (L)	
11. Educational background: No formal educa	raditional worshipper () Other () tion () Primary education hic/University ()
Date:	Time:

Enumerator ID:

Time: Location ID:

Particulate (Soil) Sample Collection Form

	Date / / / / / / / / / / / / / / / / / / /
	Location Description
 4. If "Yes", check box: Exposed to sunlight? Within 3m of faeces? Ask farmer if soil is contaminated with poultry manure 	Field Notes:
5. At lab: Weight (g)	
9. Educational background: No formal educ	Traditional worshipper () Other () cation () Primary education hnic/University ()

Date: Enumerator ID: Time: Location ID: Appendix C. Raw produce (farm) sample collection form

Raw Produce (Farm) – Sample Collection Form

Barcode/sample Id	Date / / /
	Time
1. GPS latitude	11. Mark how produce was covered
2. GPS longitude	Covered
3. Location ID:	Not covered
4. Select the source of raw produce Farm Market Home	12. Produced exposed to Sunlight: Yes () No ()
 5. Tick the type of raw produce Lettuce Carrot Cabbage Spring Onion 6. Enter the number collected: 	
 7. Indicate when (in hours) irrigation was la 8. How produce placed in whirl-pak bag (see Plastic or paper wrap Hands Other 	ast done on produce before sampling:
9. Mark if the sample was taken Within 3m of faeces Within 30m of latrine	Notes:
With flies on food	
Within 3m of sewage outfall Or open drain	
10. At lab: Weight (g) or Volume (ml	L):
Personal Information 13. Sex Male () Female () 14. Age (yrs.)	Traditional worshipper () Other () cation () Primary education chnic/University () Time: Location ID:

rcode/sample Id		Date / / / /
		Time
1. GPS latitude		11. Mark how produce was covered
2. GPS longitude		Covered
3. Location ID:		Not covered
4. Select the source of r Farm Market Home	aw produce	 12. Produced exposed to Sunlight: Yes () No () 13. How produce is displayed: a) On the ground b) >1m above ground c) <1m above ground d) Other
5. Tick the type of raw Lettuce Cabbage	produce]]	14. Is vending site concreted? Yes () No ()
 Enter the number col Type of market vend (outside main market 	or : a) At main m	arket (under shed) b) Open/street market
 8. A). Indicate how long B). Record produce s 9. How produce placed Plastic or paper wrap Hands 	torage temperatu in whirl-pak bag	re
Other 10. Mark if the sample w	Specify:	
Within 3m of faeces Within 30m of latrine		Notes:
With flies on food		
Within 3m of sewage out Or open drain 11. At lab:	tfall 🔲	
Weight (g)	or Volume	(mL):
Personal Information 6. Sex Male ()	Female ()	
 7. Age (yrs.) . 8. Religion Christian () 9. Educational background: ducation () JHS/MS () SF 	Moslem () No formal e IS/A-level ()	Traditional worshipper () Other () education () Primary Polytechnic/University ()

Appendix D. Raw produce (market) sample collection form

Appendix E. Food (salad) sample collection form	
Food (Salad) Sample Co	ollection Form
Barcode/sample Id	Date / / /
Enumerator ID:	Time
1. GPS latitude	12. Mark how salad was covered
2. GPS longitude	Covered
3. Location ID:	Not covered
 4. Select the source of ready-to-eat food Street food Hotel Restaurant 5. Select type of vendor Mobile Non-mobile 6. Indicate how long (days/hrs) produced has been stored before using for salad 7. Source of vegetables used to prepare sala Retail market d) Other (Specify): 8. How food was placed in whirl-pak bag (Plastic or paper wrap Spoon/spatula Hands Other Specify: 9. How salad was treated: a) Salt water b) Water & vinegar d) water e) other (specify) 	select one):
 10. Mark if the sample was taken Within 3m of faeces Within 30m of latrine With flies on food Within 3m of sewage Outfall Or open drain Within 3m of refuse 11. At lab: Weight (g) or Volt 	Notes
Personal Information 17. Sex Male () Female () 18. Age (yrs.) 19. Religion Christian () 20. Educational background: No formal edu () JHS/MS () SHS/A-level ()	Traditional worshipper () Other () cation () Primary education chnic/University ()

Appendix F. Questionnaire for farmers

	NNAIRE FOR FARMERS.
A. Environmental Hygiene cond	
1. Where do you normally defaect	
	farm premises () A neighbour's toilet ()
Open Defaecation ()	
	g water when working on the farm? (Tick all responses)
Sachet water () Bottled mine	eral water () Piped water () Water from home ()
B. Food Hygiene practices	
	nen at work? Once () 2 times () 3 times ()
More than 3 times ()	
4. What is the source of the food	you normally eat when at work?
	t food () local restaurant food () prepared food
on farm () Other ()	
5. Which of these do you do most	?
•	the food vending site () Eating at home () Other ()
6. Do you normally wash your ha	
Yes () No ()	-
7. If Yes, what do you wash your	hands with?
	Pipe water only () Sachet Water only ()
Soap and water ()	
C. Health Risk Perceptions and	
	sks associated with farming practices using drain water?
Yes () No ()	1 1 0
9. If yes, what kind of health risk	•
List all of them	
10. What do you do to protect your List them	
D. Socio-economic issues	
11. Does the use of drain water/dug	g-out water for irrigation increase your income as compared
to the use of piped water?	
Yes () No () Cannot te	
	rour income? Yes () No ()
13. How much time do you spend of	
14. If you have any other job, how	
Farm	Other job (s)
15. How many people depend on y	ou?
E. Personal Information	
16. Sex Male ()	Female ()
17. Age	
<u> </u>	Moslem () Traditional worshipper () Other ()
	No formal education () Primary education
() JHS/MS () SHS/A-level	
	() - j (()
Date:	Time:
Enumerator ID:	Location ID:

Enumerator ID:

Appendix G. Questionnaire for market vendors

QUESTIONNAIRE FOR MARKET VENDORS

A. Produce Hygiene conditions

- 1. Where do you normally store your produce before selling them? At the market () At home () other () specify
- 2. How do you normally store the following vegetables before selling them? (Indicate in the table below):

Vegetables	How storage is done
a) Lettuce	
b) Carrots	
c) Spring Onions	
d) Cabbage	

In a sack () In a basket () On a table but covered () In a box () Other () specify.....

3. Where do you normally display your vegetables for sale? (Indicate in the table below):

Vegetables		How produce is displa	yed
a) Lettuce			
b) Carrots			
c) Spring Onions			
d) Cabbage			
Table top ()	Basket/bowl ()	material on ground ()	bare ground ()

- 4. Do you wash the vegetables before sales? Yes () No ()
- If yes, what is the source of water for washing the vegetables?
 Piped water () well water () Tanker services () Other (specify).....
- 6. How much time do you spend on the following activities daily

Activity	Time Spent
a) Washing of lettuce	
b) Washing of carrot	
c) Cutting or removal of waste parts of cabbages	
d) Removal of waste parts of spring onions	

- 7. Are customers normally happy with the quality of vegetables sold at the market? Yes () No ()
- 8. What do customers normally complain of when at the market? Write complaints.....

B. Environmental Hygiene conditions

9. Where do you normally defaecate when you are at the market? Public toilet () Market toilet () In a polythene bag () Open Defaecation ()

	What is your source of drinking water when working at the market? Sachet water () Bottled mineral water () Piped water () Water from home () Are you normally satisfied with refuse collection and management at the market? Yes () No ()
12.	If No, what are you not satisfied with? Write down reason (s)
	Are you generally satisfied with drainage management at the market? Yes () No ()
	If No, what are you not satisfied with? Write down reason (s)
C.	Hand washing and food Hygiene practices
15.	How many times do you eat when at the market?
	Once () 2 times () 3 times () more than 3 times ()
	What is the source of the food you normally eat when at the Market?Food from home ()street food ()local restaurant food ()Other ()
17	specify Do you normally wash your hands when eating at the market?
	Yes () No ()
	If Yes, what do you wash your hands with?
	Only water () Soap and water ()
	Health Risk Awareness and Perceptions
	Where do you buy the vegetables you sell from?
	Farm gate () Wholesale market () Retail Market () Other ()
	If farm gate, do you have any reason (s) why you buy from these farm gates? Yes () No ()
	If yes, what are your reasons?
	List reasons
	Do you know of the source of water farmers use to irrigate their crops?
	Yes () No () If you know the source is drain water, would you still buy the vegetables?
	Yes () No ()
	List reasons for Yes or No answer
24.	Are you aware of any health risks associated with the consumption of vegetables that are
	irrigated with drain water? Yes () No ()
25.	If Yes, what health risks do you know of?
	List health risks
	Do you consume some of the vegetables yourself? Yes () No ()
	If you use the vegetables yourself, how many times in a week do you consume them uncooked (i.e. prepare it as salad)?

28. How much of the following vegetables do you use to prepare salad for one meal?

Vegetable	Quantity used
a) Lettuce	
b) Cabbage	
c) Spring Onion	
d) Carrot	

E. Personal Background

Female () Male () 29. Sex:

30. Age (yrs.):

31. Religion: Christian () Moslem ()

Traditional worshipper () others () 32. Education: No formal education () Primary education () JHS/MS() SHS/A-level () Polytechnic/University ()

Date: **Enumerator ID:** Time: **Location ID:** Appendix H. Questionnaire for produce buyers (market)

QUESTIONNAIRE FOR PRODUCE BUYERS (MARKET)

A. Consumption Patterns

2.	Which of these vegetables do you normally buy most at the market? Lettuce () Carrot () Spring onion () cabbage () How often in a week do you buy lettuce/cabbage from the market? What do you normally do at home to clean these vegetables?
5.	Wash with clean water () Wash in salt water () Add a disinfectant () Other () Specify Specify Add a disinfectant ()
4.	Mostly, do you consume these vegetables cooked or uncooked? Cooked () Uncooked ()
5.	If vegetables are sometimes consumed uncooked, how often in a week is this done (i.e. consumed as salad)?
6.	On average, how many of these vegetables do you use for one salad meal in a day? a). Lettuceb). Cabbagec). Spring Oniond). Carrot
7.	How many people in the house consume the salad in a day?
8.	Health Risk Awareness and Perceptions Are you aware of the source of the vegetables you buy at the market? Yes () No () What is the main reason why you buy from this market vendor and not from others? Write down the main reason
10.	Do you think the source of water farmers use to irrigate the vegetables could have influence on your decision to buy them? Yes () No ()
11.	Would you still buy these produce or not if you were aware that it was irrigated with wastewater (drain water)? Buy () Not buy ()
12.	Are you aware of any health risks associated with the consumption of produce that are irrigated with wastewater? Yes () No ()
13.	If Yes, what are the main health risks/disease you know of? Write down main health risks mentioned
14.	Have you had diarrhoea within 2 weeks after consuming salads before? Yes () No () cannot remember ()
	Environmental Conditions and Health Status Are you generally satisfied with how produce are displayed for sale at the markets? Yes () No ()
16.	Are you satisfied with the general environmental conditions at the produce vending site? Yes () No ()
17.	If No, can you give reasons?
18.	What do you think can be done by market vendors to improve environmental sanitation at the market? Write down responses

19. What do you think can be done by the government to improve environmental sanitation conditions at the market? Write down responses.

D. Personal Background

- Male() 20. Sex: Female ()
- 21. Age (yrs.):
- 22. Religion: Christian () Moslem () Traditional worshipper () others () 23. Occupation: Government/Office worker () Trading () Vocationa Vocational () Other ()

Enumerator ID:

Location ID:

Appendix I. Questionnaire for street food vendors

QUESTIONNAIRE FOR STREET FOOD VENDORS

A. Selling information

1.	How many days in a week do you normally sell cooked rice/other food with salad?				
2.	On average, how much of these vegetables do you use to prepare salad for a day? a). Lettuce b). Cabbage c). Carrot d). Spring Onion				
	On average, how many customers buy rice with salad in a day? How much time do you spend selling food at your vending site?				
5.	What do you normally do when less busy at your vending site? Chatting with friends () Washing of utensils () wait for customers () Other () Specify				
 6. 7. 8. 9. 10. 11. 12. 	 B. Produce and Food Hygiene Practices Where do you normally store the produce before using them for salad? At home () At vending site () use it immediately after buying () Other (Specify) How do you store the produce? On the bare ground () On a mat on the ground () In a box or container () Other (Specify) Where do you normally prepare the salad? At home () At vending site () Other () Specify What do you normally do to clean the vegetables before salad preparation? Wash with clean water () Wash in salt water () Use a disinfectant (Vinegar)				
	Environmental Hygiene conditions Where do you normally defaecate when you are at work on the farm? Public toilet () Neighbour's/friend's toilet () In a polythene bag () Open Defaecation ()				
15 16 17	Health Risk Awareness Where do you normally buy the vegetables you use to prepare the salad from? Farm gate () Wholesale market () Retail Market () If farm gate, do you have any reason (s) why you buy from these farm gates? Yes () No () If yes, what are your reasons? List reasons. Are you aware of the source of water farmers use to irrigate their crops?				

Yes () No ()							
19. If you know the source is drain water, would you still buy these vegetables?							
Yes () No ()							
20. If yes, could you provide some reasons							
21. If No, could you provide some reasons							
22. Are you aware of any health risks associated with the consumption of vegetable salads t	that						
are irrigated with wastewater? Yes () No ()							
23. If Yes, what health risks do you know of?							
List health risks							
24. Do you consume some of the salads yourself? Yes () No ()							
25. If yes, how often in a week do you consume them?							
26. Have you had any diarrhoea disease within 2 weeks after consuming salad foods?							
Yes () No () cannot remember ()							
E. Personal Background							
27. Sex <u>Male()</u> Female()							
28. Age (yrs.)							
29. Religion Christian () Moslem () Traditional worshipper () others ()							
30. Education: No formal education () Primary education () JHS/MS () SHS/A-							
level () Polytechnic/University ()							
1. Do you do any other work apart from street food vending? Yes () No ()							
2. If Yes, how much time do you spend on each of them?							
Street food vending Other jobs							

Enumerator ID

Location ID

Date

Appendix J. Questionnaire for street food consumers

QUESTIONNAIRE FOR STREET FOOD CONSUMERS

A. Consumption Patterns

- 1. Do you normally take the salad or only the rice? Yes, I take () No, I do not take ()
- If No, do you have any reasons why you don't take the salad? Write down reason(s).
- 3. If you take the salad, how often in a week do you normally consume street salad food ("check-check"/others)?
- 4. What makes you prefer to buy and consume street foods with salad? (tick all answers) Cheap () Convenient () I just like it () Other (specify).....

B. Health Risk Awareness and Perceptions

- Does anything influence your decision to buy the food from one seller and not the other? Write down the main reason.
- Are you aware of the source of water used to irrigate the vegetables used for the salad?
 Yes () No ()
- 7. Would you still buy or take the salad if you were aware that the vegetables used to prepare it were irrigated with drain water? Buy () Not buy ()
- 8. Are you aware of any health risks associated with the consumption of salad prepared from vegetables that are irrigated with drain water? Yes () No ()
- 9. If Yes, what is the main health risk/disease you know of? Write down the main health risk/disease mentioned

C. Environmental Conditions and Health Status

- 10. Are you generally satisfied with how the salads are prepared?
- Yes () No () don't know how they are prepared () Other () 11. Are you satisfied with the general environmental conditions at the food vending site? Yes () No ()
- 12. If No, what do you think can be done to improve the environmental sanitation conditions at the vending sites?.....
- 13. Have you ever had diarrhoea disease within 2 weeks after consuming lettuce salads? Yes () No () cannot remember ()

D. Personal Background

- 14. Sex: Male() Female()
- 15. Age (yrs.):
- 16. Religion: Christian () Moslem () Traditional worshipper () others ()
- 17. Occupation: Government/Office worker () Trading () Vocational () Other (specify)

Enumerator ID

Location ID

Date

Appendix K. Observation guide for farm workers

Observation Guide/Behaviour Record for Farm Workers

For each activity, record the time for performing the activity and also complete the exposure parameters. Observe the farmer from 7 - 10am.

Activity	Time period for	Exposures	Time period for Exposures
	activity		
1. Bed Preparation	Start time:	a) Hand in contact with soil : Yes () No ()	Hand contact time:
	End time:	b) Feet in contact with soil: Yes () No ()	Feet contact time:
		c) Hand contact with face/mouth: Yes () No ()	Tally for hand contact:
2. Transplanting	Start time:	a) Hand in contact with soil : Yes () No ()	Hand contact time:
	End time:	b) Feet in contact with soil: Yes () No ()	Feet contact time:
		c) Hand contact with face/mouth: Yes () No ()	Tally for hand contact
3. Soil tilling (Forking)	Start time:	a) Hand in contact with soil : Yes () No ()	Hand contact time:
	End time:	b) Feet in contact with soil: Yes () No ()	Feet contact time:
		c) Hand contact with face/mouth: Yes () No ()	Tally for hand contact:
4. Removal of weeds	Start time:	a) Hand in contact with soil : Yes () No ()	Hand contact time:
	End time:	b) Feet in contact with soil: Yes () No ()	Feet contact time:
		c) Hand contact with face/mouth: Yes () No ()	Tally for hand contact:
5. Watering (Irrigation) of	Start time:	a) Hand in contact with soil : Yes () No ()	Hand contact time:
crops (indicate the source	End time:	b) Feet in contact with soil: Yes () No ()	Feet contact time:
of irrigation water, e.g.		c) Hand in contact with irrigation water: Y/N	Hand contact time:
drain water)		d) Feet in contact with irrigation water: Y/N	Hand contact time:

6.	Mixing of chemicals	Start time:	a)	Farmer in hand gloves: Yes () No ()	
	(pesticides/insecticides) for spraying	End time:	b)	Feet in contact with soil: Yes () No ()	
7.	Spraying	Start time: End time:	b)	Farmer in nose mask : Yes () No () Farmer in hand gloves: Yes () No () Feet in contact with soil: Yes () No ()	Feet contact time:
8.	Harvesting (including packing of produce into sacks)	Start time: End time:	a)	Hand in contact with soil : Yes () No () Feet in contact with soil: Yes () No ()	Hand contact time:
9.	Transportation of harvested produce to road side	Start time: End time:	a)	Feet in contact with soil: Yes () No ()	Feet contact time:
10	. Eating	Start time: End time:		Farmer washed hands: Yes () No () Farmer washed hands with water and soap: Yes () No () Farmer washed hands with only water: Yes () No ()	
11	. Farmer Idle (Indicate activities)	Start time: End time:			

Enumerator ID:

Location ID:

Appendix L. Observation guide for market vendors

Observation Guide – Behaviour Record (Market Vendors)

For each activity, record the time for performing the activity and also complete the exposure parameters. Observe the Vendor from 7 - 10am.

Activity	Time period for	Exposures	Time period for Exposures
	activity		
1. Washing of carrots	Start time:	a) 'Silver' (wire) sponge used : Yes () No ()	e) Time period water used
	End time:	b) Water used for washing dirty: Yes () No ()	unchanged:
		c) Number of times water used for washing	
		changed:	
		d) Where wash water was disposed off:	
		on bare ground () drain () Other	
		(specify)	
2. Washing of Lettuce	Start time:	a) Water used for washing dirty: Yes () No ()	c) Time period water used
	End time:	b) Number of times water used for washing	unchanged:
		changed:	
		f) Where wash water was disposed off:	
		on bare ground () drain () Other	
		(specify)	
3. Cutting/removal of waste	Start time:	a) Cabbage in contact with bare ground: Yes ()	c) Time period cabbage in
parts of cabbage	End time:	No ()	contact with bare ground:

			 b) Where cabbage displayed/stored after cleaning: bare ground () table top () basket () other (specify) 	
4.	Cutting/removal of waste parts of spring onion	Start time: End time:	 a) Spring onion in contact with bare ground: Yes () No () b) Where spring onion displayed/stored after cleaning: bare ground () table top () basket () other (specify) 	c) Time period spring onion in contact with bare ground:
5.	Unpacking of produce from sacks/polythene bags	Start time: End time:	a) Where produce unpacked to: bare ground () table top () basket () other (specify)	b) Time period produce in contact with bare ground:
6.	Sweeping at vending site	Start time: End time:	 a) Rubbish collected immediately after sweeping: Yes/No b) Where rubbish was kept in: Basket () Polythene bag () taking to skip container outside/within market () Other () c) Is rubbish collected covered if it is kept at vending site? Yes () No () 	 d) Time period rubbish kept at vending site: e) Time period rubbish kept at vending site uncovered:
7.	Packing/displaying of produce for sale	Start time: End time:	 a) Where produce unpacked to: bare ground () table top () basket () Other (specify) b) Flies hovering on produce: Yes () No () 	

8. Sprinkling of water unto	Start time:	a) Type of water used: piped water () well water
produce	End time:	() Sachet water () Other (specify)
		b) How water was sprinkled: hand () Sachet
		water () use of foam () Other (specify)
9. Eating	Start time:	a) Vendor washed hands: Yes () No ()
	End time:	b) Vendor washed hands with water and soap:
		Yes () No ()
		c) Type of water used to wash hands:
		Piped water () well water () Sachet water ()
		Other (specify)
10. Vendor Idle (Indicate	Start time:	
activities)	End time:	

Enumerator ID:

Location ID:

Appendix M. Observation guide for street food vendors

Observation Guide – Behaviour Record (Street Food Vendors)

For each activity, record the time for performing the activity and also complete the exposure parameters. Observe the Vendor from 6-9 pm.

Activity/Item	Time period for	Exposures	Time period for Exposures
	activity		
1. Preparation of Salad	Start time:	a) Vendor washed hands before handling salad:	
	End time:	Yes () No ()	
		b) Source of water used to wash vegetables (ask	
		vendor if not sure of the source) :Piped water (
)	
		Sachet water () Well water () Other	
		(specify)	
		c) How vegetables were washed: Water only ()	
		Salt water () Vinegar () Other	
		(Specify)	
2. Storage of salad		a) Type of receptacle salad is kept in before	c) Time period salad was left
		serving to customers (Specify)	uncovered:
		b) Is salad covered in receptacle? Yes () No ()	
3. Serving of rice with salad	Start time:	a) Was salad covered before serving was done?	d) Time period salad was left
	End time:	Yes () No ()	uncovered:

4. Washing of Plates	Start time:	 b) How salad is served to customers: Hand () Spoon/Ladle () Other (specify) c) How chicken/meat/fish is served to customers: Hand () Spoon/Ladle () Other (Specify) a) Source of water used to wash plates: Piped 	d) Time period before water
	End time:	 water () Sachet water () Well water () Other (specify) b) Number of times water used for washing plates changed: c) Where wash water was disposed off: On bare ground () drain () Other (specify) 	used to washed plates was changed:
5. Eating	Start time: End time:	 a) Vendor washed hands: Yes () No () b) Vendor washed hands with: Water only () Water and soap () Other (specify) c) Type of water used to wash hands: Piped water () well water () Sachet water () Other (specify) 	
6. Vendor Idle (Indicate activities)	Start time: End time:		

7.	Number of Customers	Tally the number of	
		customers within the	
		observation period	
8.	Environmental Conditions		a) How refuse is managed/kept at vending site: In
	at vending site		a covered receptacle () In uncovered
			receptacle () Left on the vending ground ()
			Other (Specify)
			b) Vending site concreted: Yes () No ()
			c) Floor of vending site swept/kept clean:
			Yes () No ()
			d) Vending site within 3m of open drain: Yes ()
			No ()
			e) Flies at vending site: Yes () No ()

Enumerator ID:

Location ID: