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CHAPTER TWO REVIEW OF LITERATURE 8 h 18 AM ngày 30/4/6

2.0 Introduction

This chapter reviews the relevant literature obtained from studies to provide the context within which this study can be properly understood. The theoretical framework that has been applied for the analysis is also highlighted in this chapter. The topics covered include: theory of consumer choice (the consumer utility theory, consumer behaviour, empirical studies on consumers' WTP, socio-economic variables affecting WTP), and urban/peri-urban agriculture, (wastewater use in UPA, sources and composition of wastewater, benefits of wastewater use in UPA, risks associated with wastewater use in UPA, risks management in wastewater use, the non-treatment options of wastewater use in UPA).

2.1 Theory of consumer choice

2.1.1 The consumer utility theory

The basic economic framework of individual preferences is the standard microeconomic consumer theory of maximizing utility. An individual consumer chooses a consumption bundle faced with his budget restriction. That is;

maximize  $U(X_i)$  indifference curve  
subject to  $p_i X_i \leq M$  budget constraint

Where;

$U$  = Utility

$X_i$  is the vector of quantities

$M$  is the money income for the consumer

CHƯƠNG HAI TỔNG QUAN VỀ CÁC CÔNG TRÌNH TRƯỚC ĐÂY

2.0 Giới thiệu

Chương này tóm tắt lại một số nghiên cứu có liên quan để người đọc thấy được bối cảnh thực hiện nghiên cứu này. Chúng tôi cũng trình bày cơ sở lý thuyết được áp dụng trong quá trình phân tích của chương này. Các chủ đề bao gồm: lý thuyết về sự lựa chọn của người tiêu dùng ( lý thuyết lợi ích tiêu dùng, hành vi tiêu dùng, các nghiên cứu thực nghiệm về WTP của người tiêu dùng, các biến kinh tế xã hội ảnh hưởng đến WTP), và nông nghiệp đô thị / ven đô thị, (sử dụng nước thải trong UPA, các nguồn và thành phần nước thải, lợi ích của việc sử dụng nước thải trong UPA, rủi ro liên quan đến việc sử dụng nước thải trong UPA, quản trị rủi ro trong quá trình sử dụng nước thải, các tùy chọn không xử lý trong quá trình sử dụng nước thải trong UPA ).



$P_i$  is the price of the quantity  $x_i$   
The consumers best choice is given

where an indifference curve is tangent to the budget constraint.

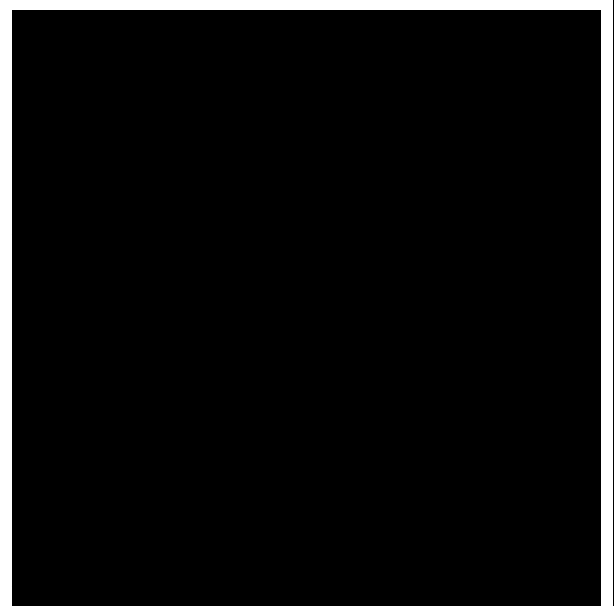
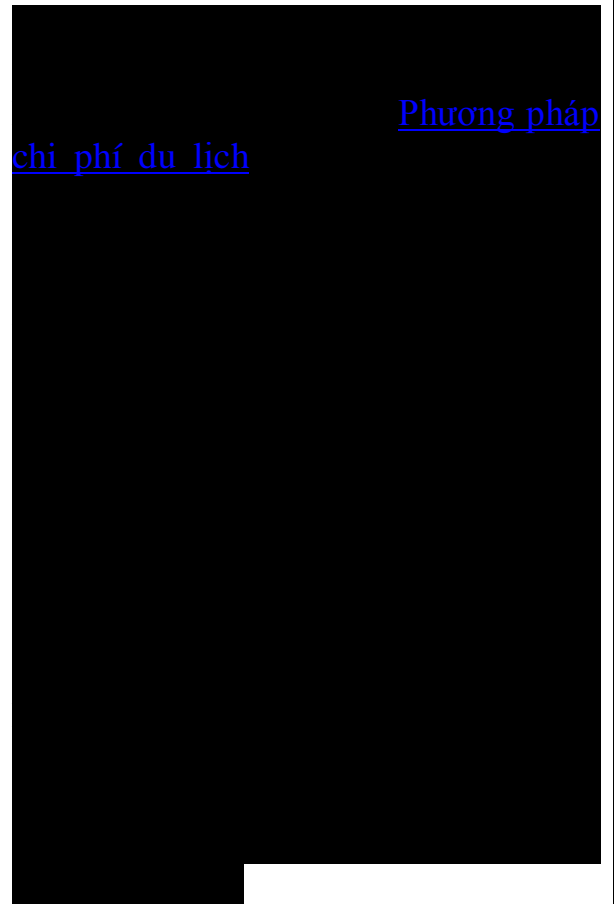
It is assumed that the consumer will exhibit a rational behavior; choosing the bundle which is at least as good as any other among all the bundles. The individual is assumed to have a set of preferences over goods and services that can be ordered in a logical and consistent manner (Hanley and Splash, 1993). This preference ordering restricts an individual's demand for different consumption bundles. Utility function therefore serves as an index for the preference ordering. This allows us to express the most preferred consumption bundle by the highest level of utility. Changes in consumption bundles which lead to increase in utility are measured by economists as consumer surplus. The consumer surplus therefore is the consumers WTP for the improved quality (Hanley et al., 1997). Health risk in this case, can be classified as risk of illness (morbidity) and risk of death (mortality). Hence, the study is to estimate an individual's WTP for health reduced risk of illness.

Economic variables associated with health benefits and environmental qualities are challenging because environmental and health benefits are

usually not traded in the market. (Hanley et al, 1997). Economists have therefore taken two fundamental routes in the development of non-market, environmental valuation techniques: the revealed preference technique and the stated preference technique.

The demands for non-market valuation have not been satisfied by the use of the revealed preference techniques; the travel cost method and the hedonic pricing technique. This is because preference revealed in the past may be of little interest where new circumstances are expected to emerge (in this case safer vegetables from the non-treatment options of wastewater use). More so, there are only limited number of cases where non-market values exhibit a quantifiable relationship with a marketed good. Hence, the focus now is on the estimation of the 'total economic value' of the environmental impact which include not only the use value but the non-use value (giá trị không sử dụng, giá trị phi sử dụng) and hence the development of stated preference technique (Bennet and Blamey, 2001).

The stated preference technique includes the use of choice experiment (CE), contingent valuation (CV) and contingent ranking and rating methods to elicit consumers' willingness to pay (WTP) for reduced health risk and an improved environmental quality (Hanley and Splash, 1993). The CV applications have concerns raised against it regarding validity of the results based on numerous biases. The contingent ranking and rating method also have their shortcoming including



are; difficulty in making interpersonal comparisons of ranking or rating data, the difficulty of respondents to rank large numbers of alternatives and the rating tasks in particular involve a departure from the context of choice actually faced by consumers. This study will employ the use of choice modeling (experiments) which is consistent with random utility theory in economics (Bennet and Blamey, 2001).

### 2.1.3 The choice experiment

Choice experiments are samples of choice sets or choice scenarios drawn from the universe of all possible choice sets. This is done according to statistical design principles such that, the overall choice experiment consists of a set that satisfy certain estimation requirements. It enables the probability of an alternative being chosen to be modeled in terms of the attributes used to describe the alternatives. Hence, it is expected that, the higher the level of a desirable attribute in an alternative, “*ceteris pari bus*” the higher the Utility associated with that option and more likely for a respondent to choose it (Bennet and Blamey, 2001). The assumption in the assessment of economic value for non-treatment options of wastewater use in urban Agriculture to bring about a change in human health risk reduction and environmental impact (soil and ground water contamination levels) is that its monetary value would reflect in consumers’ behavior. Hence, this study seeks to analyze consumers’ preferences regarding the choice of alternative scenarios of non-treatment

options of wastewater use at both the market and the farm levels.

There are two kinds of choice data: Stated Preference (SP) and Revealed Preference (RP). The SP data are generated from the decision experiment (survey), while the RP data are from consumers' actual observed choice decisions. There are some major advantages of a stated preference method compared with revealed preference studies: for example, the SP method allows researchers to estimate and predict the demand for new products with new attributes; in the marketplace, the explanatory variables have little variability and they are usually highly correlated, which makes it difficult to obtain significant estimation results, usually, SP data is less costly to collect and less time consuming than gathering RP data. Clearly, a challenge of stated preference surveys is their hypothetical nature; consumers may provide unrealistic answers if there is no cost to overstating their willingness to pay (Bennet and Blamey, 2001).

#### 2.1.4 Consumer behaviour

According to Padberg et al. (1997), consumers' are described as social beings and based on theory; their behaviour is a complex, multidisciplinary approach with contributions from different social sciences such as; economics, psychology, anthropology, geography, nutrition and medicinal sciences. Consumer behaviour is driven by three factors: emotions, motive and attitude That is, a higher emotion about produce leads to a stronger motivation

which leads to change in attitude towards the product and hence the probability of behaviour changes (purchase). The evolvement of vegetable consumption can be described as follows; the stronger the health concern, the stronger the health motive in nutrition and more positive the health image of vegetables and hence the higher the probability of purchase. Ghanaian consumers' are not left out since they are also social beings.

#### 2.1.5 Empirical studies on food buying behaviour

Consumer buying behaviour according to Lancaster, 2001, consists of activities involved in the buying and using of product or service for personal and household use. The value consumers put on food depends not only on their income but several other influencing factors:

Extrinsic attributes are used by consumers' to perceive a product quality. Hence such attributes are described to have influence on consumers' purchasing motive. A study conducted in Ghana by Oboubie et al, 2006 found that characteristics such as freshness, colour and spotless leaves were considered by consumers' when buying vegetables. In Croatia, vegetable buyers consider freshness as the most important characteristic when buying vegetables (Kovacic et al, 2002). Vietnamese demand for products from modern supply chains especially modern retailers and non-traditional imports is highly income elastic and that supermarkets expansion had impact on consumers' demand for fruits and vegetables

(Mergenthaler et al, 2007).

Sensory intrinsic attributes such as taste influences consumer buying behaviour. Combris et al, 2007, in trying to find answers to whether taste beats food safety, found that food safety instantly influenced consumers' willingness to pay while taste was preferred to the guarantee of food safety in driving buying behaviour. Through socialization, individuals' values are developed and these differ depending on one's cultural background. Hence culture-specific values can result in specific consumer behaviour (Reuters et al, 2006).

Consumers' awareness on food safety have positive benefits such as; reduction in food borne diseases/illness, reduction in time spent in the house/hospital due to the illness, reduction in cost of treatment and eventually preventing death due to food borne illness. Food safety information helps in quantifying consumers' response to food safety events, predicting market impacts and developing appropriate risk communication strategies (Beach et al., 2008). Also, for competitiveness, food safety and quality assurance is a key driver (Jatib, 2003).

#### 2.1.6 Empirical studies on WTP

In applied economics literature, empirical studies on consumers'



willingness to pay have taken different approaches. In measuring quantitative willingness to pay in monetary estimates, several authors have used the traditional contingent valuation method. This method is a direct elicitation method by questioning an individual consumer what he/she would be willing to pay contingent on there being a product or service.

For example; Boccaletti and Nardella, 2000, used contingent valuation method to assess willingness to pay for pesticides-free fresh fruit and vegetables in Italy and Garming et al., 2006, a case study of Nicaragua, also used contingent valuation method to assess willingness to pay to avoid health risks from pesticides.

Also, economists have used discrete choice, stated choice experiments and a host of other elicitation methods to elicit direct monetary estimates of willingness to pay for a product.

For example; Goldberg et al, 2005, used both the choice experiments and contingent valuation methods to measure consumers willingness to pay for a health risk reduction of Salmonellosis and Campylobacteriosis in Germany whilst Trivisi and Nijkamp, 2004, used the stated choice experiment approach to measure Italians willingness to pay for Agricultural environmental safety. Other approaches used to estimate

willingness to pay include; conjoint analysis (as in Ara, 2003); survey rankings and ratings (as in Quagraine, 2006); travel cost method (as in Gonzalez and Loomis, 2006) and experimental auction method (Yue et al., 2006; Groote et al., 2006). Generally, results of consumers' willingness to pay have been shown to be positive and modest ranging between five to twenty percentage.

Even though willingness to pay techniques have been used extensively in Agriculture to assess several risks factors. None of such studies have been carried out in relation to wastewater use in urban/peri-urban agriculture. Hence this study used the stated choice experiment approach to estimate in monetary terms, Ghanaian consumers' willingness to pay for "safer" vegetables produced from the non-treatment options of wastewater use in urban and peri-urban vegetable production.

#### 2.1.7 Socio-economic variables affecting consumers' WTP

A broad range of factors have been found to influence/ affect consumers' willingness to pay. Numerous studies have examined the effects of socioeconomic variables on consumers' willingness to pay for safer vegetables. Boccaletti and Nardella, 2000, used contingent valuation method to measure Italian consumers' willingness to pay for pesticide-free fresh fruit and vegetables and they found that consumers' willingness to pay is

positively related to income and risk concern but negatively related to education.

#### APPENDIX B

CONSUMER SURVEY  
QUESTIONNAIRE MEASURING  
CONSUMERS' WILLINGNESS TO  
PAY FOR SAFER VEGETABLES IN  
GHANA.

QUESTIONNAIRE NUMBER [ ]

INTERVIEWER NUMBER [ ]

DATE OF INTERVIEW  
(DD/MM/YY) / /200

CITY WHERE INTERVIEW TOOK  
PLACE: ACCRA [ ], KUMASI [ ].

NAME OF AREA: [ ]

HOUSE NUMBER: [ ]

#### INTRODUCTION

Please I am,(interviewers name), a student of , who would like to spend 20 min. of your time by asking you a few questions concerning food safety.

This is a survey on wastewater use in urban vegetable production and the health and environmental risks associated with the use of this water.

The questionnaire is three parts:

Part A consists of questions on the socio-demographic characteristics of the interviewee.

Part B consists of questions on food safety issues.

Part C consists of questions on consumers WTP to gain improvements in health and environmental risk reduction of the non-treatment options of wastewater use

PART A: SOCIO-DEMOGRAPHIC  
CHARACTERISTICS OF  
INTERVIEWEE

<p>1. PERSONAL INFORMATION</p> <p>1.1 Name of household (NMHH)</p> <p>1.2. Gender of respondent (GENDER)</p> <p><input type="checkbox"/> Male</p> <p><input type="checkbox"/> Female</p> <p>1.3. Age (specify in years) years (AGE)</p> <p>1.4. House hold size (specify number) members (HH)</p> <p>1.5. Educational level of responden(EDU)</p> <p><input type="checkbox"/> Primary education</p> <p><input type="checkbox"/> Junior secondary/middle education</p> <p><input type="checkbox"/> Senior secondary education</p> <p><input type="checkbox"/> Tertiary education</p> <p><input type="checkbox"/> others (specify)</p> <p>1.6 Marital status (MARISTAT)</p> <p><input type="checkbox"/> Married</p> <p><input type="checkbox"/> Single</p> <p><input type="checkbox"/> Divorced</p> <p><input type="checkbox"/> other (specify)</p> <p>2. OCCUPATION (HHOCCUP) HOUSEHOLD MEMBER MAJOR OCCUPATION (MAJOCCUP) MINOR OCCUPATION (MINOCCUP) HH MEMBER 1 HH MEMBER 2 HH MEMBER 3</p> <p>3.0 HOUSEHOLD INCOME (INCOME) HOUSEHOLD MEMBER AVERAGE INCOME/MNTH (GH 0) Major occupation Minor occupation MEMBER 1 MEMBER 2 MEMBER 3</p>	
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TOTAL

**PART B: VEGETABLE SAFETY ISSUES**

4. Vegetable consumption behavior (CONSBEH)

4.1 Within the past 6 months have you eaten vegetables? (EATVEG)

- Yes (if yes, continue with 4.2)
- No (If no terminate interview)

4.2 If yes to 4.1, where do you mainly eat the vegetables? (YSWHE)

- Home
- Restaurant
- Food vendors
- Others (specify)

4.3 List the type of vegetable eaten and the frequency (TYPEFREQ)

Type of vegetable      Frequency/month  
Average amount  
spent/month  
(GH0)

4.4 In which form do you usually eat your vegetables? (FRMEAT)

- Raw form
- Cooked form

4.5 What characteristics do you look for in a quality (healthy looking) vegetable?

- Greenish leaves
- Cleanliness
- Spots on the leaves     Freshness
- Others (specify)

5. Vegetable safety issues (VEGSAF)

5.1 Have you heard or read about diseases or illnesses caused by vegetables? (DSECSV EG)

- Yes (if yes, continue 5.2)
- No (If no go to 5.4)

5.2 If yes, where/how did you hear

[REDACTED]

about it? (HWVGSAFE)

- Radio
- Newspapers
- Television
- Through friends/family members
- Others (specify)

5.3 From your knowledge can you list some of the diseases or illnesses caused by eating contaminated vegetables (CSEDVEG)

5.4 Have you or any member of your household fallen ill for eaten contaminated vegetables? (SDSE)

- Yes (if yes, continue with 5.5)
- No (if no go to 5.7)

5.5 If yes to 5.4 above, do you think the illness was? (SVRITY)

Very Severe severe not very severe not severe at all

- 

5.6 How many days did the illness keep you at home?

■ days

5.7 Did you or your household member visit the doctor because of the illness? (VSTDCTOR)

- Yes
- No

5.8 Vegetables sold in the cities are produced within the cities mostly using wastewater from the streams and drains. Do you think this wastewater can be the cause of the diseases/illnesses related to vegetables? (WWCSEDSE)

- Yes
- No

► If yes, why do you think the wastewater can cause diseases when used in vegetable production? (YSWHYWW)

6. Sources of Vegetables for the Household and Opinion (HHSOCE/OPN)

6.1 Where do you get your regular supply of vegetables? (VGSPLY)

- Farm gate
- Market vegetable retailer
- Street hawkers
- Supermarkets
- Others (specify)

6.2 What does a safe vegetable mean from the stand point of wastewater use? (MNSFEVEG)

7. Vegetable food chain (VEGFDCHN)

7.1 Along the vegetable food chain (ie. From production, transportation, marketing and the consumer-kitchen level), where do you think vegetables get contaminated?

(VGCNTD)

- farm/production level
- During transportation
- At the market level
- Consumer-kitchen kevel
- Other (specify)

7.2 If the answer to 7.1 is farm/production level, what in your opinion do you think is/are the cause (s) of the contamination?

(FMCSECNTD)

- Water used
- Pesticides
- Poor handling
- Others (specify)

7.3 It is tried and tested that vegetables produced from the non-treatment options of wastewater use, from production through to the consumer kitchen level, are “safer” in terms of pathogen content. I would like to get your opinion from the levels as below

[Redacted content]

(NNTTSFETY);

Strongly agree somewhat disagree  
strongly agree agree disagree

a) .Vegetables produced  
by safe water application

methods reduces the pathogen content  
significantly (FWAPP)

b) . when market women  
wash

vegetables with clean water all

the time, the pathogen further reduces  
(MWAPP)

c) . further washing boiling of  
vegetables at consumer kitchen

level further reduces the pathogen  
level.(WBKHNL)

PART C: WILLINGNESS TO PAY  
QUESTIONS (WTP)

8. Consider carefully the following  
options. Suppose these were the only  
options available, which one would,  
you choose? (CMQNS)

ATTRIBUTE

OPTION A

Status quo

OPTION B

Improved use of watering cans

OPTION C

Cessation of traditional irrigation  
allowing pathogen die-off

OPTION D

Use of drip kids

OPTION E

Traditional irrigation in addition to  
washing vegetable produce with clean  
water

% of HH Expenditure on Food  
(HHEXP) NONE

(0%) 5% 7% 9% 6%



% Health Risk (Pathogen)  
 Reduction (HRR) NONE  
 (0%) 16.7% 25% 33.3%  
 16.7%

% Reduction in Soil and Ground  
 Water Contamination  
 (SGW) NONE  
 (0%) 8% 8% 9% 5%

Would you  
 choose (please  
 select only one option)   
 I would choose option A   
 I would choose option B   
 I would choose option C   
 I would choose option D   
 I would choose option E

