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QUALITY OF LIFE FOR OCCUPATIONAL RISKS OF COCOA FARM WORKERS IN NIGERIA

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ABSTRACT

Research background: Cocoa remains the Nigeria's highest foreign exchange earner among all agricultural commodities, Contributed 12.5-14% of the national GDP. Currently, Nigeria is the fourth largest cocoa producing country in the world, produced approximately 328,652 tons annually. Occupational risk is a major factor reducing productivity of farm workers as it impairs physical capacity and increase vulnerability to ill health, diseases and injuries. Risk of agrochemical exposure has been attributed to work demand and unhealthy work environment.
Purpose of the article: This study aimed to estimate life quality for agrochemical exposure risks of cocoa farm workers in Ondo state Nigeria. The study specifically estimates the amount an individual willingness to pay by respondents for occupational risk reduction**.**
Methods: Multistage sampling technique that guaranteed cocoa farmers who could provide desired information on the basis of the objectives of the study was adopted for the study. Random selection of 180 cocoa farm workers from the study area. Descriptive statistics (frequency, mean and percentage) and Discrete Choice Experiment (DCE) approach that dovetailed into choice modelling and conditional logistic regression were the analytical tools used.
Findings & Value added: the result revealed that 74% of the cocoa farm workers are on active age and mainly male with the mean age of 46 years. Most of the workers are illiterate that cannot read instructions on the agrochemical container. Average workers are willing to pay 830 Nigerian naira for personal protective equipment, 92 Nigerian naira for 15% wage discount as financial benefit of workplace injuries and 1024 Nigerian naira for training of workers in pesticide usage. The study concluded that better health conditions and appropriate use of personal protective equipment minimize the occupational risk. It was therefore recommended that educational programmes that will enhance farmer's knowledge, skills and attitude to use safe methods (appropriate use of protective equipment) in pesticide usage should be adequately planned. Appropriate use of personal protective equipment to reduce exposure to agrochemicals and the risks involved in the misuse and abuse of agrochemicals should be adopted.

Key words: quality of life; cocoa farm workers; choice experiment approach
JEL Codes: R52; R58; H41

INTRODUCTION

The importance of cocoa (Theobroma cacao) to Nigeria's economy cannot be overemphasized. Though Nigeria gets her foreign exchange earnings from crude petroleum, yet cocoa remains the Nigeria's highest foreign exchange earner among all agricultural commodities. However, the contribution of cocoa to Nigeria's total exports earnings during the last two decades has dropped considerably. **Nwachukwu *et al.* (2010)** identify low yields, inconsistent production patterns, disease incidence like Black pod; swallow shoot virus etc. pest attack like mirids and little agricultural mechanization as key factors leading to decreasing cocoa production in Nigeria.

In 2007 and 2008, agricultural produce contributed 41.9% and 37.8% to non-oil export out of which cocoa contributed 12.5% and 13.9% respectively (**CBN, 2011**). National Bureau of statistics **(NBS, 2019)** reported that Nigeria's cocoa commodity export was 18 billion Nigerian naira (NGN) (47.2 million USD) in the second quarter of 2019. This represents a 29.65% increase in the value of cocoa commodity exports year-on-year. Currently, Nigeria is the fourth largest cocoa producing country in the world, produced approximately 328,652 tons 2020 (**FAO, 2020).**

Additionally, the ageing of cocoa producing trees also plays a role in the decrease of productivity. Particularly, 60 percent of cocoa farms are over 40 years old, thus hampering productivity.

Quality of life is the marginal rate of substitution between income and mortality risk. Promptly, this measures the amount at which individuals are willing to trade money for reduced risk of death (**Viscusi and Aldy, 2003**).

In principle, this trade-off can be measured by observing individual character. The value of risk reductions is a major element of the benefits of environmental policies. They are two key pieces of

information for the quality of life calculation. A quantifiable risk reduction magnitude and an individual's willingness to pay for a risk reduction of that magnitude.

The other method regularly used to estimate quality of life is stated preference studies, which are sometimes used because the value of the risk reduction in question is often difficult to assume from observed behaviour and market prices. Stated preference methods provide non-market valuation techniques that are designed to estimate how much people would be willing to pay for a good or service that is not actively traded in markets. By using surveys, researchers can quietly question individuals about how much they would be willing to pay for various types of risk reductions.

Occupational risk can be described as a condition surrounding a work environment that increases the probability of death, illness or disability to a worker while hazard is the intrinsic property of a substance or process that could cause injury or damage (**WHO, 1987**).

Farm can be source of life-threatening hazards (**International Labour Organization, 1994**), The most important indicator for safety and health is workload per worker both physical labour and decision- making or mental workload, farmers experienced many fatal injuries happen to them working with familiar equipment in familiar fields, while doing tasks that they have been performing for years and even decades. Risky agricultural materials such as pesticides, fertilizers, flammable liquids and other solvents are responsible for acute and chronic illness in farm workers and family members. Tractors and other mechanized equipment have permitted a dramatic increase in the land but mechanization has contributed to severe injuries in agriculture significantly to the health risks (**ILO, 1994**). In many countries, the use of agrochemical is highly regulated. Occupational risks are injuries that occur at the location of a person's employment which can include exposure to chemicals or other substances as well as accidents. Occupational accidents, work injury, work-related injury, work accidents, work-related accidents are other names for occupational injuries. The main cause of occupational injuries is the result from exposure to harmful agents usually toxins, gases, inhalants, etc. while working (**Andrina, 1998**).

Agriculture is one of the most hazardous sectors of activity, both in industrialized and developing countries. According to the International Labour Organization **(ILO, 2000),** estimated that 14% of all occupational injuries are due to exposure of pesticides and other agrochemical constituents, and 3.4% of agricultural workers are killed each year. About hundred (100) Millions of agricultural workers will be injured on the field with poisoned by pesticides and other agrochemicals by 2020. The World Health Organization (WHO) and the United Nations Environmental Programme (UNEFP) estimated that one to five million cases of pesticide poisoning occur among agricultural workers each year with about 20000 fatalities **(United Nation, 2002).**

Vigneri (2007) also reported that the major challenging of cocoa which was observed in the 2001 and 2003 season was initially the result of the cocoa mass spraying programme, combined with a dramatic rise in fertilizer use. The cocoa sector continues to face problems such as inadequate storage facilities, pest and diseases, child labour issues, and occupational risks.

This study was carried out to estimate life quality for agrochemical exposure risk. Specifically, the study would; Estimate the amount an individual willingness to pay by respondents for risk reduction.

LITERATURE REVIEW

Quality of life estimation naturally acquires or apprehends how much people are willing to pay to minimize the risk of death. Because risks to life come from a plenitude of sources and individuals can undertake many different actions to reduce these risks, it follows that there are many ways to estimate the quality of life.

Methods to estimate the quality of life can be broadly group into stated preference and revealed preference approaches and to date most of the empirical studies eliciting individual willingness to pay (WTP) to reduce occupational risks have been based on either the hedonic regression method **(Rosen, 1974)** applied on compensating-wage-differentials **(Aldy and Viscusi, 2007),** or the contingent valuation (CV) method applied in a vast range of different settings **(Lindhjem *et al*., 2011).** The former is a revealed preference (RP) method in which actual decisions are used to derive monetary values. A discrete choice experiment (DCE) is a stated preference survey approach which allows the researcher to quantify the relative importance of factors that influence decision making. DCE provides information on the strength of preferences, trade-offs individuals are willing to make, and changes in the probability of choices if levels within factors are changed **(World Health Organization, 2012)**. The approach which combines random utility theory, consumer theory, experimental design theory, and econometric analysis assumes that individuals choose between options to achieve the highest utility or benefit **(De Bekker-Grob, Ryan, & Gerard, 2012; Cameron and DeShazo, 2013)**. There has been a steady increase in the use of stated preference (SP) methods to estimate willingness to pay (WTP) for non-market goods. **Andersson *et al*. (2014)** suggests that DCE is more common to value non-market goods than the CVM method.

In this study, DCE employed to elicit individual preferences to minimize occupational risks among cocoa farm workers. The reason for using Stated Preference method because of the combination of the public goods and the conditions of the special market, which means that we prefer a controlled hypothetical market to actual market data by elicit preferences for several attributes. Nonmarket valuation techniques usually consider respondents' WTP for training for effective usage of agrochemical and personal protective equipment **(Johnston *et al*., 2017)**.

Wenyu *et al*. (2018) estimate farmer's willingness to pay for health risk reductions of pesticide use in china using contingent valuation approach and binary logit regression. The results showed the means willingness to pay (WTP) was 451.11CNY per household per year. It was reported that education or training programs should be launched for farmers to enhance their knowledge of

pesticides and their risk perceptions. **Kamara *et al.* (2018)** investigate willingness to pay for health insurance among informal sector workers in Sierra Leone using Discrete Choice Experiment (DCE) approach and random effect logit regression model. The result revealed that workers are willing to pay about 10,180SLL/$1.38 for switching to a faith-based provider and 24712SLL/$124.86 to public provider for health insurance. It reveals that informal sector households are WTP more for a faith-based provider than a public provider for an improvement in coverage. It was concluded that policy maker that is in establishing a health insurance scheme should focus more on the faith based provider and the type of coverage.

Fadiji *et al.* (2020) determined compensating wages of agrochemical exposure risks of cocoa farm workers and the causes of agrochemical exposure risks in Ondo state using hedonic regression. The results show that 57.8% of the respondents violated the permissible residue prescription, 88.9% of respondent were unable to read instructions on the agrochemical containers and 65% of respondents were not aware of personal protective equipment and it was concluded that appropriate use of personal protective equipment minimizes agrochemical exposure risks.

DATA AND METHODS

Sampling Procedure

Multistage sampling technique that guaranteed cocoa farmers who could provide desired information on the basis of the objectives of the study was adopted in selecting respondents. The first stage was the purposive selection of Idanre Local Government Areas the Nigeria's leading cocoa producing area.

The second stage is the random selection of 12 communities/villages namely Oke-idanre, Baale-ojumu, Owomofewa, omilifon, Apomu, Ala-Elefosan, Owena, Atosin, Arapa, Obatedo, Apefon and Iramuje from the selected LGA. The last stage is the random selection of fifteen (15) cocoa labourers working with cocoa farmers from each village, making a total sample size of one hundred and eighty (180) respondents.

Source, Type and Method of Data Collection

The use of primary data was employed for this study. Primary data was collected from cocoa farm workers through the use of structured interview schedule or guide, data collected was on socioeconomic characteristics such as age, sex, marital status, level of education, Farming experience, etc. question on occupational risk reductions based on the choice experiment method such as training of workers on effective use of pesticides, wage discount as the financial benefit of the workplace injury and illness and provision of personal protective equipment for farm workers, was also collected.; Choices made by each individual, together with the values of each attribute in each choice.

The questionnaire was developed by using the results from pilot study (pre-test). The purpose of the pre-test is to ensure the clarity of the questions in the questionnaire and to check the appropriateness of the chosen attributes as well as their levels. The results from the pre-test survey were used to adjust the price and to refine the draft questionnaire.

Choice sets were designed by orthogonal design, to ensure that all levels of the attributes are considered equally.

Table 1 shows the attribute and level used for the estimation of willingness to pay for risk reductions. Attributes selected for the study were based on the questionnaire.

Respondents were provided with seven (7) choice sets. Each choice set contains two or more alternatives with common attributes but different levels. Respondents were asked to choose the most preferred option from each choice set. Table 2 show the choice sets used for the estimation of willingness to pay for risk reductions.

In the face to face interview the respondents were asked to choose the most preferred option from each choice set and clarification were provided where necessary.

Data for this study was analysed with both descriptive and econometrics techniques. The descriptive techniques employed include; frequency counts, percentages, means and standard deviation, the econometric techniques employed was regression analysis and conditional logistic regression analysis.

Discrete Choice Experiment

For analytical purposes, the Discrete Choice Experiment (DCE) approach was used to estimate willingness to pay for risk reduction. The method is firmly established in Lancaster's theory of consumer choice (**Lancaster, 1966**) which postulates that consumption decisions are determined by the utility that is derived from the attributes of a good, rather than from the good itself. The econometric basis of the Choice Experiment depends on the behavioural framework of random utility theory, which describes discrete choices in a utility-maximizing framework **(McFadden, 1974; Ben-Akiva *et al.*, 1985)**. Thus, it can be assumed that farm workers, asked to look for reduction of occupational risks, make their choices on the basis of the specific features for risk reduction. The utility obtained from a certain risk reduction feature is then the sum of the utilities obtained from each choice in the attributes defined in the Choice experiment design.

Questionnaire data were analysed using a random utility theory, which was chosen because we modelled choices on reduction of occupational risks.

The random utility model is represented by Eq. 1.

$$U_{in} = V_{in} + \varepsilon_{in} \quad (1)$$

Where:

U_{in} is the utility derived by worker i when choosing reduction of risk n;

V_{in} is the deterministic component of the utility, typically assumed to be certain;

ε_{in} is the error component that captures the factors unobservable influences on choice.

The risk reductions are uncertain because it depends on stochastic variables such as Training, premium discount and personal protective equipment among others. According to **Lusk and Norwood (2005)**, claimed that the

probability of an attribute to occur could be included as another attribute of choice, this is in accordant with random utility theory. The regular and orderly part of the utility is then given by Eq. 2.

$$V_{in} = \alpha_n + \beta_1(Ptraining)_{in} + \beta_2(Pnone\ training)_{in}\ \beta_3(Pwage\ discount(none)_{in} + \beta_4(Pwage\ discount(10\%)_{in} + \beta_5(Pwage\ discount(15\%)_{in} + \beta_6(Ppersonal\ protective\ equipment)_{in} + \beta_7(PnonePPE)_{in} + \beta_8(Pprice)_{in} \quad (2)$$

Where:
α_n alternatives specific constant that represents the utility of choosing the status quo risk reduction (n=option C);
Ptraining probability of training of workers in pesticides usage (workers to undergo training on how to use the pesticide);
Pnone training no training of workers on pesticide application;
Pwage discount (none) is the probability that cocoa farm workers are not willing to pay for financial compensation for workplace injuries and illness;
Pwage discount (10%) probability that cocoa farm workers are willing to pay 10% discount of daily wage as the financial compensation for workplace injuries and illness;
Pwage discount (15%) probability that cocoa farm workers are willing to pay 15% discount of daily wage as the financial compensation for workplace injuries and illness;
Ppersonal protective equipment probability of given protective gadget;
Pnone personal protective equipment probability of no protective gadget;
PPrice probability of the price attribute;

The probability that the respondent will make a particular choice is given by Eq. 3.

$$\text{Prob}\{V_{in} + \varepsilon_{in} \geq V_{jn} + \varepsilon_{jn} \text{ for all } j \in C_n\} \quad (3)$$

Where:
C_n is the choice set for individual n. If ε_{in} are independently and identically distributed across the n alternatives and N individuals with a type I extreme-value distribution, then the probability that the respondent will make a particular choice is estimated using the conditional logit (CL) model by Eq. 4.

$$\text{prob(n is chosen)} = \frac{\exp^{V_{in}}}{\sum_{j \epsilon C} \exp^{V_{jn}}} \quad (4)$$

The Conditional Logit approach is limited by the assumption of independence of irrelevant alternatives (IIA) and by model errors being independently and identically distributed across alternatives.

According to **(Speelman, 2013)**, estimate that farm worker willingness to pay for a change in attribute levels by taking the ratio between the coefficients of individual attributes and the price attribute as follows by Eq.5.

$$WTP_a = \frac{-\beta_a}{\beta_{price}} \quad (5)$$

Where:
WTP_a is the willingness to pay for occupational risks reduction (i.e ratio of marginal utility and estimated parameter of price associated to the alternatives);
β_a is the marginal utility of an attribute *a*;
β_{price} is the estimated parameter of price associated to the alternatives.

Table 1: Attribute and level in discrete Choice

Attributes	Level 1	Level 2	Level 3
Training	Training	Training	None
Wage discount	None	10% discount	15% discount
Personal Protective equipment	PPE	PPE	None

Table 2: Choice Sets

Card ID	Runs	Training	Wage discount (%)	Personal Protective Equipment	Price (NGN)
1	1	Training	None	PPE	100
	2	Training	15%	None	150
	3	None	10%	PPE	200
2	1	Training	10%	None	150
	2	Training	None	PPE	200
	3	Training	15%	PPE	200
3	1	Training	None	None	100
	2	None	None	PPE	150
	3	Training	15%	None	100

RESULTS AND DISCUSSION

Socio-economic characteristics of the Respondents

The results in Table 3 show the socioeconomic characteristics of cocoa farm workers. The results of the age distribution of the cocoa farmers in the study area shows that cocoa farm workers fall within 36-60 years (74.44%), The mean age is 46 years. While youth comprised only 20.56%. This indicates that most of the farmers are in their active and productive age. It is expected that younger farmers will be more innovative to reduce occupational risks while older farmers may be poorer in terms of welfare ages.

The productive activities of males and females in agriculture are very important and must be taken into consideration. The result of the analysis shows that majority (88.33%) of the respondents are males while 11.67% are females, **Osewa *et al.* (2013)** revealed that women in the rural area in Nigeria are being naturally denied access to land for cultivation of cash crops. The result is in line with the findings of **Mabe *et al.* (2020)** that cocoa production is perceived not to be a suitable occupation for women.

The results show that 55.0% of the cocoa farm workers had first school leaving education. While only 13.39% had above 9 years of education. The modal years of schooling were primary school. The implicit meaning is that most workers are illiterate.

The marital status shows that the majority of the respondents (81.67%) are married, 4.44% are single while 4.44 % are divorced and 9.44% are widowed. The implicit meaning is that cocoa farmers depend on family labour as a direct source of labour therefore, the more the number of a family, the more the valid labour force and consequently, the more the productivity.

The results show that about 84.4 % of the farmers have above 20 years working experience. The mean cocoa farming experience of about 22 years in the study area suggest that cocoa farmers in the study area had considerable years of farming experience which could translate to increased productivities. This clearly portrayed that most respondent in the study area have adequate experience in cocoa production.

The Rate of payment shows that the majority of the respondents 95% are paid on daily basis, 3.33% are paid monthly while 0.56 % are paid hourly and sharecropping. Majority (70.56%) of the cocoa farm workers had not undergone pesticide training while 29.44% of the respondents had been trained on pesticide application by Non-governmental organizations (NGOs). This implies that cocoa farmers in the study areas were not knowledgeable in the arts of pesticide application.

Conditional logit models were estimated using the data obtained from the survey. This is a basic specification that provides the importance of the chosen attributes in explaining respondents' preferences for different options. Table 4 shows the utility that was determined by the attributes (Training, None, Wage discount 10% and 15%, PPE and price) and their levels in the choice sets. The value of probability of chi-square of 0.000 shows the overall significance of the model at 1% probability level ($p<0.01$), pseudo R-squared shows that 7.55% variations of risk reduction was jointly explained by the significant explanatory variables.

The coefficients for the training attribute are negative and significant ($p<0.01$), meaning that an increase in risk as a result of lack of training due to pesticide use as a likelihood decrease the utility of the respondents.

The negative sign of PPE ($p<0.01$) means that respondents would be willing to pay more for adequate care and save work environment. This implies that usage of private gadgets ensures safe work environment and so less wage compensation.

The negative sign of the coefficient for price ($p<0.05$) attribute means that an increase in cost as a likelihood decrease the utility of the respondents.

The negative sign of the coefficient of 15% wage discount ($p<0.01$) means that respondents would be willing to pay more for financial benefit of workplace injuries and illness.

The 10% wage discount is positive but not significant means that the variable associated with the 10% wage discount did not influence the respondent's choice, this implies that the 10% wage discount is not consideration important to the respondents.

Estimation of Willingness to Pay for Agrochemical Exposure Risks reduction

Willingness to pay is the maximum amount that average cocoa farm workers willing to pay or trade-off for reduction of occupational risk (i.e ratio of marginal utility and estimated parameter of price associated to the alternatives). Table 5 shows that on average workers are willing to pay more for risk reduction, the negative coefficients shows that respondents are willing to pay for risks reduction. Upper and lower limit indicate the confidence limit s of the willingness to pay estimates.

Average cocoa farm workers are willing to pay about 1043 NGN per season for training on effective use of pesticides application, for the risk reduction that features in the attribute. This is in line with **Osawa *et al.* (2013)** findings that the cocoa farmers do not follow the recommendations of the instructions printed on pesticide bottles/containers.

Average workers are willing to pay 843 NGN for personal Protective equipment for risks reduction. The result is in accordance with **Devi *et al.* (2012)** that protective equipment minimizes the health risk and injuries associate with the job of the cocoa farm which emphasizes the necessity for ensuring the use of protective measures in farm fields against the risk exposed due to pesticide application.

Average cocoa farm workers were WTP about 92 NGN for 15 per cent daily wage discount as the financial compensation for workplace injuries and illness. Wage discount is a financial benefit that will stand as an income protection for the cocoa farm workers and give support to the farm workers through a period where they cannot work due to illness or injury.

Table 3: Socioeconomics characteristics of the Respondents

Characteristics	Frequency	Percentage (%)
Age(Years)		
≤ 35	37	20.56
36 – 60	134	74.44
Above 60	9	5.00
Total	180	100
Mean	46±9.6	
Sex		
Female	21	11.67
Male	159	88.33
Total	180	100
Educational background		
≤ 3	18	10.00
4-6	99	55.00
7-9	38	21.11
Above 9	25	13.89
Total	180	100
Mean	6.56±2.5	
Marital status		
Single	8	4.44
Married	147	81.67
Widowed	17	9.44
Divorced	8	4.44
Total	100	100
Farming experience		
≤ 10	2	1.11
11 – 20	25	13.89
Above 20	152	84.44
Total	180	100
Mean	22±11.2	
Pattern of Payment		
Hourly	1	0.56
Daily	171	95.00
Weekly	1	0.56
Sharecropping	1	0.56
Monthly	6	3.33
Total	180	100
Trained on Pesticide Application		
Yes	53	29.44
No	127	70.56

Source: Field Survey, 2019.

Table 4: Estimated coefficient of Conditional Logit models

Variable	Coef.	Std. Err.	z-value	p>z
Price	-0.0010374**	0.000487	-2.13	0.036
Training	-1.081836***	0.2206205	-4.23	0.000
None	1.049257***	0.2477841	4.75	0.000
Wage discount (10%)	0.1574165	0.1310448	1.20	0.230
Wage discount (15%)	-0.095109	0.1610257	-0.59	-0.555
Wage discount (none)	0.4591829***	0.1360101	3.38	0.001
PPE	-0.8749302***	0.109102	8.02	0.000
Log-likelihood	-1284.60			
Prob > chi^2	0.000			

Note: ***, **, * Significant at 1%, 5% and 10% respectively
Source: Field Survey, 2019.

Table 5: Willingness to pay for Occupational Risk Reduction

	Training	None training	10% discount	None discount	15% discount	PPE
WTP	-1042.79	1011.394	151.736	442.613	-91.677	-843.3582
Lower limit	-3272.89	-3132.947	-184.195	-499.581	-507.066	-1017.128
Upper limit	1187.295	1110.159	487.667	1384.807	323.712	2703.844

Source: Field Survey, 2019

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings, the study concluded that better health conditions and appropriate use of personal protective equipment minimize the occupational risk.

Low usage of Personal Protective Equipment also exposes farmers to the risk of being exposed to agrochemicals. These constitute some serious health risk as a consequence of the toxicity contents of some chemical compounds that these agrochemicals contain. This study find that the use of personal protective equipment minimizes the risk of health damage and less compensation for risk, which emphasizes the necessity for ensuring the use of protective equipment on the farm fields against the risk exposed due to agrochemical application.

Educational programmes that will enhance farmer's knowledge, skills and attitude to use safe methods (appropriate use of protective equipment) in agrochemical usage should be adequately planned. Appropriate use of personal protective equipment to reduce exposure to pesticides and the risks involved in the misuse and abuse of pesticides.

Moreover, the study shows that respondents are willing to pay on average, more for protective gadget, compensation insurance and training of workers on effective use of pesticides.

Lastly the result shows that a high preference for the training of cocoa farm workers for effective usage of pesticide, and are WTP on average, about 1043 NGN for the risk reduction that features in this attribute. This in line with the many studies which have shown that the farmers do not follow the recommendations on the instructions printed on pesticide bottles/containers.

The authors suggest that policy maker should provide insurance program like income protection policy for farm workers as financial benefit for farm workers on any illness or injury sustained on the farm field.

REFERENCES

ALDY, J. E., & VISCUSI, W. K. (2007). Age differences in the value of statistical life: revealed preference evidence. *Review of Environmental Economics and Policy*, *1*(2), 241–260. https://doi.org/10.1093/reep/rem014

ANDERSSON, H. (2014). Willingness to pay and sensitivity to time framing: A theoretical analysis and an application on car safety. *Environmental and Resource Economics*. *56*(3), 437-456. https://doi.org/10.1007/s10640-013-9644-0

ANDRINA, L. (1998). Statistics of occupational injuries. *Sixteenth International Conference of Labour Statisticians* Geneva, Switzerland. 1998, p. 62.

BATEMAN, I. J., CARSON, R. T., DAY, B., HANEMANN, M., HANLEY, N., HETT, T., JONES-LEE, M., & LOOMES, G. (2002). *Economic valuation with stated preference techniques: A manual.* Cheltenham: Edward Elgar.

BEN-AKIVA, M. E., & LERMAN, S. R. (1985). Discrete choice analysis: theory and application to travel demand; MIT Press: Cambridge, MA, USA, 1985, p. 385. https://mitpress.mit.edu/books/discrete-choice-analysis

CAMERON, T. A., & DESHAZO. J. R. (2013). Demand for health risk reductions. *Journal of Environmental Economics and Management 65* (1), 87–109. https://doi.org/10.1016/j.jeem.2012.05.008

CBN, CENTRAL BANK OF NIGERIA. (2011). Annual report and statement of accounts. https://www.cbn.gov.ng/out/2010/publications/reports/rsd/annual%20report%202009.html

DE BEKKER-GROB, E. W., RYAN, M., & GERARD, K. (2012). Discrete choice experiments in health economics: A review of the literature. *Health Economics*, *21*(2), 145-172. https://doi.org/10.1002/hec.1697

DEVI, P. I., SHANMUGAM, K. R., & JAYASREE, M. G. (2012). Compensating wages for occupational risks of farm workers in India. *Indian Journal of Agricultural Economics, 67*(2), 253-264.

FADIJI, D., OKOJIE, L., AKERELE, D., OKOJIE. J. (2020). Compensating wages of agrochemical exposure risks of cocoa farmworkers. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. 20*(3), 239-246.

FAO. Food and Agriculture Organization (FAO) (2020). *Green climate fund*, FAO, Rome, Italy. Food and Agriculture Organization Media Relation. https://www.fao.org/news/story/en/item/1304085/1code/

FRN. Federal Republic of Nigeria. (2009). Legal notice on publication of 2006 census final result. Official Gazette, Abuja: Federal Government Printer.

ILO. International Labour Organization. (1994). Safety and health in the use of pesticides: A guide; International Labour Office: Geneva, Switzerland. https://www.ilo.org/safeworkinfo/instr/WCMS_110196/lag-en/index.html

ILO. International Labour Organization. (2000). *Top on the Agenda: Health and Safety in the Use of Pesticides: A Guide*. International Labour Office: Agriculture. Labour Education 118, p. 1-119

JOHNSTON, R. J., BOYLE, K. J., ADAMOWICZ, W., BANNETT, J., BROUWEE, R., CAMERON, T. A., HANEMANN, W. M., HANLEY, N., RYAN, M., SCARPA, R., TOURANGEAU, R., & VOSSLER, C. A. (2017). Contemporary Guidance for Stated

Preference studies. *Journal of the Association of Environment and Resource Economics*, *32*(3), 421-438. https://doi.org/10.1086/691697

KAMARA, J., JOFRE-BONET, M., & MESNARD, A. (2018). A Discrete Choice Experiment to Elicit the Willingness to Pay for Health Insurance by the Informal Sector Workers in Sierra Leone. *International Journal of Health Economics and Policy*, *3*(1), 1-12. https://doi.org/10.11648/j.hep.20180301.11

LANCASTER, K.J. (1966). A new approach to consumer theory. *Journal of Political Economics 74*, p. 132–157. https://doi.org/10.1086/259131

LINDHJEM, H., NAVRUD, S., BRAATHEN, N, A. & BIAUSQUE. V. (2011). Valuing mortality risk reductions from environmental, transport, and health policies: A global meta-analysis of stated preference studies. *Risk Analysis, 31* (9): 1381–1407. https://doi.org/10.1111/j.1539-6924.2011.01694.x

LUSK, J. L., & NORWOOD, F. B. (2005). Effect of experimental design on choice-based conjoint valuation estimates. *American Journal of Agricultural Economics*, *87*, 771–785. https://doi.org/10.1111/j.1467-8276.2005.00761.x

MABE, F.N., DANSO-ABBEAM, G., AZUMAH, S.B., BOATING, N, A., MENSAH, K.B., & BOATING, E. (2020). Drivers of youth in cocoa value chain activities in Ghana. *Journal of Agribusiness in Developing and emerging Economies*, *10*(2), 1-13. https://doi.org/10.1108/JADEE-10-2019-0177

MCFADDEN, D. (1974). *Conditional logit analysis of qualitative choice behavior*. In Frontiers of Econometrics; Zarembka, P. E., Ed.; Academic Press: New York, NY, USA, 1974, pp. 105–142.

NPC. NATIONAL POPULATION CENSUS. (2006). Analysis of Nigeria 2006 Census Result, NPC, Abuja, Nigeria.

OSENI, J. O. (2011). Impact of climate change on agriculture. *Moroccan Association of Agricultural Economics (AMAEco) Conference*. Rabat, Morocco. 2011. P.7

OSEWA, S. O., ALAMU, O., OKONKWO, H. O., ADETILOYE, I. S. & AJAYI, D. A. (2013). Occupational hazards and safety practices of cocoa farmers in Obokun local government of Osun State. *Greener Journal of Agricultural Sciences*, *3*(12), 823-828. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1067.4759&rep=rep1&type=pdf

ROSEN, S. (1974). Hedonic prices and implicit markets: product differentiation in pure competition. *The Journal of Political Economy 82* (1): 34–55. https://www.jstor.org/stable/1830899

SPEELMAN, S., & VEETTIL, P. C. (2013). Heterogeneous preferences for water rights reforms among smallholder irrigators in South Africa. *Bio-Based Applied Economics*, *2*, 131-149. https://doi.org/10.13128/BAE-11074

UN. UNITED NATIONS (2002). Economic, social and cultural rights. Meeting coverage and press releases on 29th of November, 2002. Committee on economic, social and cultural rights concludes twenty-ninth session. Issues Conclusions on Reports from Poland, Slovak Republic, Georgia, Solomon Islands and Estonia. https://www.un.org/press/en/2002/hr4632.doc.htm

VIGNERI, M. (2007). *Drivers of cocoa production growth in Ghana*. Overseas Development Institute. Project Briefing No 4. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/590.pdf

VISCUSI, W. K., & ALDY, J. E. (2003). The value of a statistical life: a critical review of market estimates throughout the world. *Journal of Risk and Uncertainty*, *27(*1*)*, 5-76. http://www.jstor.org/stable/41761102

WENYU, W., JIANJUN, J., RUI H., HAOZHOU, G., & YUHONG, T. (2018). Farmers' willingness to pay for health risk reductions of pesticide use in China: A contingent valuation study. *International Journal of Environmental Research and Public Health, 15*(625), 1-10. https://doi.org/10.3390/ijerph15040625

WHO. WORLD HEALTH ORGANIZATION (1987). Health and safety components of environmental impact assessment. Environment Health Series 15, WHO Copenhagen. https://apps.who.int/iris/handle/10665/279977

WHO. World Health Organization, (2012). How to conduct a discrete choice experiment for health workforce
recruitment and retention in remote and rural areas: a user guide with case studies. http://www.who.int/hrh/resources/DCE_UserGuide_WEB.pdf