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Compensating wages for agrochemical exposure risks of cocoa farm workers

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ABSTRACT

Occupational risk is a major factor reducing productivity of farm workers as it impairs their physical capacity and increase their vulnerability to ill health, diseases and injuries. Agrochemical exposure risk has been attributed to work demand and unhealthy work environment that these workers are subjected to which they are often not compensated. Consequently, this study estimated the compensating wages of life quality for agrochemical exposure risks of cocoa farm workers in Idanre Local Government Area, Ondo State, Nigeria. Multistage sampling technique was used to select 180 cocoa farm workers and the data on factors affecting agrochemical exposure risks. Data were analyzed using descriptive statistics and linear hedonic regression. Linear hedonic regression showed that temperature (β = 5.02), health index (β = 9.65) and participating in agrochemical spraying (β = 44.71) had positive and significant ($p<0.05$) influence on compensating wages, while smoking (β = -41.77) and use of personal protective gadgets during spraying (β =-31.67) had negative and significant ($p<0.05$) influence. Cocoa farm workers received ₦75.00k per day as compensation for incurring occupational risks. The study concluded that appropriate use of personal protective equipment minimizes agrochemical exposure risks. It is therefore recommended that educational programs that will enhance farmer's knowledge, skills and attitude to adopt safety measures in pesticide usage should be adequately planned.

Key words: Compensating wages, cocoa farm workers, Hedonic wage approach.

INTRODUCTION

The importance of cocoa (*Theobroma cacao*) to Nigeria's economy cannot be overstated. Though Nigeria gets her foreign exchange earnings from crude petroleum, yet cocoa remains the Nigeria's highest foreign exchange earner among all agricultural commodities, of which the countryis the fifth largest exporter of in the world (Oseni, 2011).

However, contribution of cocoa to the Nigeria's total exports earning in the last 20 years has dropped significantly. In the 60s, the country produced about 15% of world cocoa annually and was the second largest producer of the crop in the world (Utomakili and Abolagba, 1996). In the 70's quantity of cocoa produced was about 308,000 tonnes (Adeyeye, 2012). In recent years, however, cocoa output ranges between 185,000 and 215,000 tonnes (Oseni, 2011).

Previous authors have conducted studies on the overdependence on crude petroleum as the Nigerian source of foreign exchange, small farm holdings, low yield, inconsistent production pattern, disease incidence, pest attack and climate change (Wood, 1985; Villalobos, 1989; Wright, 1993; Obatolu et al., 2003; Oluyole and Sanusi, 2009).

In Nigeria cocoa is the most valuable cash crop among farmers in the major producing areas. About 20 million people depend directly on cocoa for their livelihood, 90% of the productions are exported in the form of beans or semi-

manufactured coca products (Taphee et al., 2015).

Compensating Wages is the extra amount of income that a given worker must be offered in order to motivate them to accept given undesirable job, relative to other workers in other occupations. Compensating wages is the difference in wages offered to offset the desirability or undesirability of a job. If the job is taken into undesirable because of components of risk, the differential is positive in the form of increased wages to offer incentives to the employee to take the job. If the job is considered desirable, the differential is negative in the form of lower wages.

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

Farm can be source of life-threatening, farmers sometimes experienced many fatal injuries working with familiar equipment in familiar fields while doing tasks that they have been performing for years and even decades. Quick and chronic illness of farm workers and family members are caused by harmful agricultural materials such as pesticides, herbicides, flammable liquids and other solvents. Tractors and other mechanized equipment make the farm works easier and increase the output of the farm but mechanization has contributed to severe injuries in agriculture (ILO, 1994). Significant health risks: 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 and 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).

The World Health Organization (WHO) and the United Nations Environmental Programme (UNEFP) estimated that 1-5 million cases of pesticide poisoning occur among agricultural workers each year with about 20 000 fatalities (Economic Social and Cultural Rights, 2002).
Agrochemical exposure risk can be measured by:

(i) Objective measure of risk: It is the measurement of the likelihood of fatal or non-fatal injury of the worker.
(ii) Subjective measure of risk: This measures the use of danger perception (occurrence of risk) dummy indicator that takes the value 1 if the worker believes that his job exposes him to harmful or unhealthy conditions and 0 otherwise. Gerking et al. (1988), Viscusi (1979), and Fairris (1989) showed that self-reported riskiness of one's job is considerably and positively related to an individual's wage. Subjective measure of risk was used in the present study.

Marcella (2007) reported that mass spraying of cocoa combined with a dramatic rise in fertilizer use are the major challenges facing cocoa sector. These were observed in the 2001 and 2003 production season. The cocoa sector continues to face problems such as inadequate storage facilities, pest and diseases, child labour issues, and occupational risks. Occupational risk is a major factor reducing productivity of farm workers as it impairs their physical capacity and increase their vulnerability to ill health, diseases and injuries. Agrochemical exposure risk has been attributed to work demand and unhealthy work environment that these workers are subjected to which they are often not compensated (McNeill and O'Neill, 1998). This study was carried out to estimate the expected compensating wages received by the workers incurring job related health risk and Identify factors causing agrochemical exposure.

METHODOLOGY

The study was carried out in Ondo State, Nigeria. The state is located in the south-western part of the country and lies between longitude $4^0$31' and $6^0$00' east of the Greenwich Meridian and latitude $5^0$15' and $8^0$15' North of the Equator. It is bounded by Ekiti and Kogi State in the north; Edo State in the east; Ogun and Osun States in the west and the Atlantic Ocean in the south (SOSG Diary, 2010). The Ondo State has a projected population of 4,724,870 (NPC, 2019) and covers an area of 14,793sq.km at 120 km north of the ocean. The state is made up of 18 Local Government Areas (LGAs).

Agriculture is the mainstay of the state and 65% of the state depend on agriculture as the main occupation, (Folayan et al, 2007). As regards cocoa production, Ondo State is the largest cocoa producing state in Nigeria, about 50% of Nigeria's annual cocoa production (Ajayi*et al*., 2012). Other cash crops produced in large scale in the state include palm produce and rubber. Food crops such as maize, yam and cassava are also produced in large quantities. The state is also blessed with very rich forest resources where indigenous and exotic timber species in Nigeria abound. Idanre Local Government Area is the Nigeria's largest cocoa producing area (Frank 2001). Idanre Local Government Area cover an area of 1,914 km^2 and a projected population of 177,183 (NPC, 2019). The Local Government Area is bounded to the north-west by Ondo east and ile-oluji/oke-igbo local government, to the north-east by Ifedore, Akure south and Akure north local government areas.

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 Area as 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 for the study. The last stage is the random selection of 15 cocoa laborers 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 were collected from cocoa farm workers through the use of structured interview schedule or guide. The data collected were on socioeconomic characteristics such as age, sex, marital status, level of education, Farming experience, etc. Pattern of payment questions was collected to estimate the compensating wage received by the respondents,

Analytical technique

Data for this study were analysed with both descriptive and econometrics techniques. The descriptive techniques that were employed include; frequency counts, percentages, means and standard deviation. These were used to analysed the factors that causes agrochemical exposure. Various human factors that lead to the pesticides exposure risk and the parameters that were described are residue violation, illiteracy and ignorance, lack of awareness of personal protective equipment, smoking habit etc. The econometric techniques were employed, Ordinary Least Square(OLS) regression analysis, to estimate the expected compensating wages received by cocoa farm workers.

Viscusi and Aldy (2003) specified that:

$$W_i = \alpha + \beta p_i + \Sigma_k \gamma_k X_{ki} + \varepsilon_i \quad \ldots\ldots\ldots \quad (1)$$

Where
X = worker's personal characteristics variables (such as age, education, wearing of personal protective gadgetand smoke) and job characteristics variables (such as temperature and agrochemical participation) for worker 'i',
pi = job (injury and or fatal) risk faced by worker 'i', and
ε_i = Disturbance or error term reflecting unmeasured factors influencing worker i's wage rate.
α = Constant term,
β and γks = parameters to be estimated using regression analysis,

This model follow Devi et al. (2012) specification that **β** is a parameters to be estimated using regression analysis. Agrochemical exposure risk (fatal and non-fatal) is an objective measure of risk:

$$W = \alpha + \beta_1 \text{ Risk } + \beta_2 \text{ Age} + \beta_3 \text{ Education} + \beta_4 \text{ Wearing of personal protective gadget} + \beta_5 \text{ Smoke} + \beta_6 \text{ Temperature} + \beta_7 \text{ agrochemical participation} + \beta_8 \text{ Body health mass index} + \ldots\ldots \quad (2)$$

Where
W = Daily wage rate (₦)
X_1 = Risk (1= workers expose to dangerous conditions or unhealthy, 0= otherwise)

Risk is a subjective measure of risk; it is a dummy variable which indicate that worker believes that his job exposes him/her to dangerous or unhealthy conditions (such as sickness after pesticide spray operation):

X_2= Age of the workers (Years)
X_3 = Level of education (Years)
X_4 = Wearing of personal protective gadget (1= Use of Personal Protective Equipment during spraying, 0= otherwise)
X_5 = Smoke (1= smoking during pesticide application, 0= otherwise)
X_6= Temperature (atmospheric temperature ^{0}C during spraying period)
X_7 = agrochemical participation(1= participating in agrochemical spraying, 0 = otherwise)
X_8 = Body mass index = (Wt/Ht^2 x 100).

Devi et al. (2012) specified that:

Compensating wage = coefficient of risks (β_1) …… (3)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The results of the age distribution of the cocoa farmers in the study area show 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 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.

Gender plays important roles in farm activities carried

Table 1: Socioeconomics characteristics of respondents.

Characteristics	Frequency	Percentage	Means	Standard Deviation
Age(years)			46	0.7161419
1 – 35	37	20.56		
36 – 60	134	74.44		
Above 60	9	5.00		
Total	180	100		
Sex			0.8611111	0.0258486
Female	21	11.67		
Male	159	88.33		
Total	180	100.00		
Educational background			6.567416	0.1849484
0-3	18	10.00		
4-6	99	55.00		
7-9	38	21.11		
Above 9	25	13.89		
Total	180	100.00		
Marital status				
Single	8	4.44	2.185393	0.0500371
Married	147	81.67		
Widowed	17	9.44		
Divorced	8	4.44		
Total	100	100.00		
Farming experience			22	0.0299576
1 – 10	2	1.11		
11 – 20	25	13.89		
Above 20	152	84.44		
Total	180	100.00		
Pattern of Payment			2.078652	0.0323142
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			0.7318436	0.0332042
Yes	53	29.44		
No	127	70.56		
Total	180	100		

Source: Field Survey, 2019.

out by farmers. The survey showed that majority (88.33%) of the respondents were male and 11.67% of the cocoa farm workers were female. This implies that cocoa farm workers in the study areas were dominated by male. This result is in agreement with those of Akinori (2000) and Osewa et al (2013) who reported that women in the rural area in Nigeria are being innately denied access to land for cultivation of cash crops.

Table 1 shows that 55.0% of the cocoa farm workers had first school leaving education. While only 13.39% had

Table 2: Factors causing agrochemical exposure.

Variables	Frequency	Percentage
Residue Violation		
Yes	104	57.8
No	76	42.2
Total	180	100
Reading Instruction		
Yes	20	11.1
No	160	88.9
Total	180	100
Awareness of protective equipment		
Yes	63	35
No	117	65
Total	180	Total
Smoking Habit		
Yes	44	24.4
No	136	75.6
Total	180	100

Source: Field Survey, 2019.

above 9 years of education. The modal years of schooling were primary school. The implicit meaning is that most workers are illiterate. Table 1 further shows that the majority of the respondents (81.67%) were married, 9.44% were widowed and 4.44% were single and divorced. The implicit meaning is that cocoa farm workers depend on family members 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 of the present study 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 farm workers in the study area had considerable years of working experience which could translate to increased productivities. This clearly described that most respondent in the study area have adequate experience in cocoa production.

The survey showed that majority of the respondents 95% were paid on daily basis, 3.33% were paid monthly while 0.56 % were 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 farm workers in the study area were not skillful in the arts of pesticide application.

Factors causing agrochemical exposure

a. Residue violation
b. Illiteracy and ignorance
c. Lack of awareness of personal protective equipment
d. Smoking Habit

a). Residue violation: Table 2 shows majority of the respondent (57.8%) violated the residue prescriptions, while 42.2% did not violate the chemical residue. For toxic nature of some pesticide, deposited residues on the plant are dangerous to the farmer and his environment. Since cocoa serve as a major cash crop used in foreign exchange, non-compliance with the stated rule and regulations, overuse and too frequent applications of the chemical have become potential sources of danger, injury or harm to the applicator and the environments.

Good Agricultural Practice (GAP) showed that Maximum Residue Levels are the maximum concentration of pesticide residue expressed as milligrammes of residue per kilogramme that is likely to occur in or on food and feeding stuffs after the use of pesticides. FAO (2011) highlighted that residue may be violated when the pesticide applicator failed to apply agrochemical in line with the recommendation label on the product such as application rate, number of applications, formulation, timing and pre-harvest interval

b). Illiteracy and ignorance: Table 2 shows that majority of the farm workers were unable to read the instructions written on pesticides containers, because most of the farmers are illiterate. 11.11% of the respondents can always read instructions written on the containers, while

88.9% report that they sometimes read the instruction. This result supports the findings of Grey et al. (2006) that pesticides bottle labels are helpful to the farmers. This finding is in line with the findings of Bassi et al. (2016) who reported ignorance among cocoa farmers about the health risks caused by the usage of high dosage of agrochemical. The result is also accordance with the findings of Xu (2004) and Huang et al. (2008*)* who reported that it is a difficult task for illiterate farmers to comprehend written instructions on agrochemicals and unable to access other useful information or details unless it is imparted verbally or through some practical demonstration.

c). Lack of awareness of personal protective equipment: Majority of the cocoa farm workers (65%) in the study area are not aware of PPE, while 35% are using protective equipment. Respondent that are not complying with wearing of protective gear can be easily expose to pesticide toxicity; the exposure can occur through the mouth(oral), inhalation(respiratory), skin(dermal), and eyes(visual). Oluromin iyi and Emily (2011) highlighted that human exposure to agricultural pesticides may be through ingestion (oral), inhalation (respiratory), skin (dermal), and eyes (visual). The implication of this is that the cocoa farmers are prone to experiencing health symptoms such as skin irritation, respiratory disorder and redness of eyes among others due to their exposures to pesticides. Respondents were asked about their use of Personal protective equipment (gloves and masks) and more than half did not use, while few always use PPE to protect themselves from direct pesticide exposure. Therefore, uneducated farmers may not be serious with wearing of personal protective equipment (PPE). This is in line with the findings of Perry et al. (2002) that compliance with usage of personal protective equipment during application of Actara26WG, Ridomil and Nordox75WP was very low among some field crop farmers.

d). Smoking habit: The data in Table 2 showed that 24.4% of the respondents smoke during pesticide application, while 75.6% answer that they never smoke during pesticide application. The practice of smoking while spraying agrochemicals was also reported among cocoa farmers. This is quite risky because it increases the likelihood of direct oral ingestion of agrochemicals. Damalas and Eleftherohorinos (2011) highlighted that exposure of farm workers to agrochemicals increases when the basic recommendation of properly washing hands after spraying or before eating is not observed.

Protective equipment used by cocoa farm workers

Majority of the respondents (65%) did not use hand glove, 35% of the respondents wear hand glove, nose guide (4.4%) and eye cover (6.7%) during application of agrochemicals (Table 3). 54% of the respondents wear boot to farm while 44% of the workers did not wear farm boot. This is in line with the findings of Olowogbon (2011) that 65% of farmers in Nigeria do not use Personal Protective Equipment (PPE) in their farming activities. The absence of nose guide, hand gloves and eye cover usage among farm workers may lead to high incidence of headache, severe fever, skin rashes/irritation, chemical inhalation and spillage on their bodies.

Estimation of compensating wages received by farm workers incurring job related health risk

Compensating wages is the extra amount of income that a given worker must be offered in order to motivate workers to accept a given undesirable job, relatives to other workers could perform. It is the difference in wages offered to offset the desirability or undesirability of a job. If the job is considered unwanted because of elements of risk, the differential is positive in the form of increased wages to offer incentives to the employee to take the job. If the job is considered desirable, the differential is negative in the form of lower wages.

Table 4 shows the results of estimation of compensating wage. The result shows that Age is positive ($p<0.1$) and Education is positive ($p<0.01$). This result supports the findings of Devi et al. (2012) that the returns of workers with lesser education in agricultural job are higher than the returns for workers with higher education. This implied that workers with less education are more productive in the agriculture job than workers with more education, because the job options are rather low.

WEARING OF PPE is associated with negative ($p<0.05$), indicating that workers with adequate care receive less wage compensation than workers without care. The implicit meaning is that usage of personal protective equipment ensures safe work environment and so less wage compensation.

The workers' personal habits variable 'Smoke' had negative parameters ($p<0.05$). This means that the wages for workers with the habit of smoking are less than workers without the habit. The result shows that workers with smoking habits are risk lovers or risk takers so that they demand less or no compensation for occupational hazards. This is in line with the findings of Hersch and Viscusi (1998) who reported that smokers are more likely to take risks or get injured than nonsmokers. Temperature variable is also associated with a positive coefficient ($p<0.05$). This implies that working under hot sun will pose workers into health risks. Such workers supposed to demand higher wages as per the expectation of the compensating differential theory.

Health index variable is associated with a positive coefficient but not significant, indicating that healthy

Table 3: Uses of personal protective equipment in the study area.

Personal Protective Equipment	Frequency	Percentage
Foot protection	97	53.9
Eye cover	12	6.7
Hand glove	63	35
Nose cover	8	4.4
Total	180	100

Source: Field Survey, 2019.

Table 4: Estimation of wage equations.

WAGE	Coeff	Std. Err.	t-value	p>t
Constant	902.6092***	332.5037	2.71	0.007
AGE	0.933146	1.019236	0.92	0.361
EDUCATION	1.045793**	0.402493	2.59	0.011
RISK	74.79754***	26.80494	2.8	0.006
TEMPERATURE	5.017797**	2.016404	2.5	0.013
HEALTH INDEX	9.208049	8.371428	1.10	0.273
WEARING PPE	-31.66634**	13.52674	-2.34	0.022
SMOKE	-41.78657**	20.90020	-2.00	0.045
R-squared	0.501			
F-value	4.30			
P>F	0.3412			
Mean VIF	1.04			
Ramsey Reset Test	0.413			

Source: Field Survey, 2019.
***p<0.01, **p<0.05, *p<0.1.

workers with high wages are more productive, but this result is not supported by t-value. The variable of interest is RISK. It influences the wage rate positively (p<0.01), indicating that workers on jobs which they perceive as being dangerous (lead to sickness) earn an earnings premium of ₦75 per day.

Multicollinearity was not a problem given the low value 1.04 of the computed Variance Inflation Factor (VIF). R-squared indicated that 50.1% variation in estimation of compensating wages was jointly explained by the significant explanatory variables. The probability of F showed that the variables in the model are fit to explain the estimation of compensating wages. The Ramsey Reset Test showed that the null hypothesis of specification error was rejected; this implies that the model was rightly specified.

Estimation of compensating wages received by farm workers handles pesticide

Table 5 shows the estimation results of wage equation which additionally include Agrochemical participation variable, which is dummy indicator for whether worker participating in agrochemical spraying or not.

Age is positively statistically significant (p<0.05). This result support the findings of Garming and Waibel (2009) that age of the farmers is associated with longer history of agrochemical exposure and generally lower health status especially if they have suffered from sickness or illnesses caused by pesticide exposure.

Health Index variable is associated with a positive coefficient and is statistically significant (p<0.05). The result indicates that healthy workers are more productive and receive higher wages. Education is positive (p<0.1).

The RISK variable had a positive and significant (p<0.05) effect on wages. The results indicate that workers participating in agrochemical spraying received an additional compensation of ₦86 per day for facing occupational hazard.

Agrochemical participation variable is positive and significant (p<0.05), indicating that worker handling pesticides receive significantly higher wages than their counterparts who do not handle it.

Temperature variable is also associated with a positive coefficient and it is statistically significant (p<0.05). This implies that workers with higher health risk while applying

Table 5: Regression estimation of wage equations.

WAGE	Coeff	Std. Err.	t-value	p>t
Constant	843.2508***	330.8206	2.55	0.012
RISK	85.95385**	40.02263	2.15	0.033
AGE	0.7059785**	0.356555	1.98	0.048
EDUCATION	0.5815242	3.966553	0.15	0.884
TEMPERATURE	4.207083**	1.752951	2.40	0.018
HEALTH INDEX	9.65034**	4.106527	2.35	0.020
WEARING PPE	-36.07781**	17.618269	-2.05	0.044
SMOKE	-33.6305	25.17818	-1.34	0.183
AGROCHEMICAL PARTICIPATION	44.71282**	22.02243	2.03	0.045
R-squared	0.605			
F-value	4.57			
P>F	0.1627			
Mean VIF	1.05			
Ramsey Reset Test	0.1075			

Source: Field Survey, 2019.
***p<0.01, **p<0.05, *p<0.1.

pesticides under hot sun demand higher wages than other workers on the cocoa farm. This is in accordance with the compensating differential theory.

Wearing of PPE is associated with a negative and significant coefficient (p<0.05), indicating that workers with personal protective equipment receive less wage compensation than workers without care. Perry et al. (2002) found that compliance with wearing of protective gear during application of chloroyrifo, thiamethoxam, and cyanazine was very low among some field crop farmers. This finding is also in line with the finding of *Sosan* et al. (2009) who reported that cocoa farmers in Nigeria are occupationally exposed to the toxic nature of insecticide application for mirid control in their cocoa plantations. The implicit meaning is that usage of PPE ensures safe work environment.

Multicollinearity was not a problem given the low value 1.05 of the computed Variance Inflation Factor (VIF). R-squared indicated that 45.7% variation in estimation of compensating wages was jointly explained by the significant explanatory variables. The probability of F showed that the variables in the model are fit to explain the estimation of compensating wages. The Ramsey Reset Test showed that the null hypothesis of specification error was rejected; this implies that the model was rightly specified.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the present study, it can be concluded that appropriate use of personal protective equipment minimizes agrochemical exposure risks. Application of agrochemical under higher temperature (above 25^0C) increases the chances of health damage and so workers demand higher wage for this 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. We 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 pesticide application.

This study reported higher risk level associated with more toxic chemical contents and there is no differential wage rate for spraying chemicals of varying toxicity level. Therefore, the study estimated that farm workers receive ₦86 per day for the chemical dosage they handle as compensation wage for agrochemical exposure risk. It is therefore recommended that educational programs that will enhance farmer's knowledge, skills and attitude to adopt safety measures in pesticide usage should be adequately planned. Appropriate use of personal protective equipment is necessary to reduce exposure to pesticides and the risks involved in the misuse and abuse of pesticides. In addition, training on Integrated Pest Management (IPM) methods is also necessary and environment friendly, and could reduce the potential exposures to pesticides. Receiving higher compensation wages by cocoa farm workers will act as an economic instrument to restrict the use of high toxic chemicals.

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