

Pesticide Use Practices and Safety Issues: The Case of Cocoa Farmers in Ondo State, Nigeria

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ABSTRACT This study investigates pesticides in common use in cocoa agriculture, dangers associated with their use and established regulatory incentive (if any) that protect farmers and farm workers against pesticide risk. The study was conducted in Idanre local government area of Ondo state, Nigeria. A total of fifty farmers, fifty farm workers and thirty two pesticide marketing agents were interviewed using structured questionnaire. The commonly used pesticides identified are Gammalin 20, Aldrex 20, Perenox, Cacaobre Sandoz, copper sulphate, Basudin, Thionex and Uden. Result reveals that most of these pesticides are classified as 'highly' or 'moderately' hazardous by the world Health Organization and have been banned or restricted in many economically advanced countries. Contrary to this most of the marketers claimed that the pesticides are registered in Nigeria and do not present acute health hazards to users, by-standers, livestock, wild-life, and environment in general. Analysis shows that farmers are not taking the necessary precautions to prevent hazards associated with their use. Farmers and farm workers suffer from discomforts ranging from headaches, tiredness, vomiting and nausea to skin problems such as skin burn and itching after using these pesticides. Although the Federal government of Nigeria through the Federal Environmental Protection Agency recognizes the problems of pesticides use and has put in place legal and administrative procedures to protect users as well as the nation's environment from the adverse effects of pesticides, work on effective monitoring, enforcement or implementation of their procedures and mechanisms is not being pursued with the seriousness required.

INTRODUCTION

Cocoa farmers use a wide range of pesticides to limit losses from pests and diseases in cocoa agriculture. Prominent among these are: Copper sulphate (a fungicide popular in the treatment of black pod infection; Benzene Hexachloride (BHC) (an insecticide for control of cocoa mirids); Aldrin/Dieldrin or Aldrex 40 (to control mealy bugs); Carbamate Uden. (an insecticide which is effective in controlling cocoa mirids in West African countries) (Berger and Aro, 1977). Others are Kokotone, Apeco, Perenox, Arkotone, Didimac 25, Basudin and Brestan.

Pesticide use is associated with risk and can be hazardous if not handled properly. Cocoa farmers using pesticides containing Aldrin, Gamma BHC, Cuprous oxide, Copper sulphate, Paraquat dichloride etc. face constant exposure to these pesticides (Fajewonyomi, 1995). According to Takagi et al. (1997), risks associated with pesticide use can be divided into two:

i. Risk associated with human beings: i.e., toxicity categorized as acute toxicity, chronic toxicity, carcinogenicity, tetragenicity and biological concentration. Human exposure to pesticides is an important health and social issue as it usually results in serious health problems such as epilepsy, stroke, respiratory disorders,

cancer, leukamia, brain and liver tumours, convulsions etc. Death has been known to occur in some places as a result of exposures to these pesticides.

ii. Risk associated with the environment: This manifests in the disturbance of the ecosystem, principally in the form of pollution of river water, groundwater, drinking water, soil and air, reduction of fish and wildlife populations, destruction of natural vegetation etc. (Pitmentel et al., 1980)

Cocoa farmers and farm workers may have come into contact with pesticides during the application process or when entering recently treated areas.

There is a high probability that pesticide use and pesticide – induced side effects (costs) will grow more rapidly in developing countries as a whole than in the developed ones (Yudelman et al., 1998). This is because of weak regulations banning the importation and use of dangerous chemicals and the inactivity or absence of government and non - government environmental control agencies.

Despite the fact that the Dirty Dozen pesticides are banned, severely restricted or unregistered in many countries and despite their having been listed as hazardous by the World Health Organisation (WHO), Fajewonyomi (1995)

stated that many of them are still widely promoted and applied especially in developing countries where weak controls and dangerous work conditions make their impact even more devastating.

Papworth and Paharia (1978) stated that since pesticides by their very nature are toxic and can be hazardous to users if not handled properly, their regulation through registration is of great value to developing countries. It is not the increasing use of pesticides that warrants regulation through suitable legislations but the tendency, through ignorance, for overuse, misuse or abuse of pesticides. Snelson (1978) stated that registration as used in this context implies the acceptance by a statutory authority of extensive document proof submitted in support of all claims for efficacy and safety made for the proposed product.

Registration enables authorities to exercise control on use levels claims, labeling, packaging and advertising and thus to ensure that the interest of end users are well protected. After discovering that application of pesticides causes severe contamination of vegetables with residues in HoChin Minh city, Vietnam, Nguyem et al. (1998) suggested that instruction sessions should be organized by the local authorities to show farmers how to correctly apply pesticides on their vegetable fields, set up demonstration field using insecticides correctly, distribute leaflets on accurate and safe use of insecticides on vegetables to all vegetable growers, run broadcast from the city broadcasting outfit to educate farmers about safe and accurate application of pesticides to protect their own health and that of consumers.

Wetterson (1988) reported that a number of governments and companies within the agrochemical industry provide little, if any, health and safety information on pesticides beyond a label, which reaches pesticide users in the field. In some countries, the labels may be in a language not understood by the users who may not be literate.

Davis et al (1992) modeled three regulatory incentive systems that may induce farmers to protect farm workers from pesticide-related hazards. These are ex post regulation via a tort – liabilities and workers compensation system respectively and ex ante regulation (fines) by administrative agencies.

Kolstad et al. (1990) define ex ante policies

as those that affect an activity before an externality is generated and ex post policy as one that regulates an externality only after it has been generated and harm has occurred.

The first ex post incentive is experience rated workers' compensation. The single ex ante structure considered is administrative agency regulation. Results indicate tort liability and administrative agency regulation as practiced provide relatively insignificant incentives while a workers' compensation system if fully experience rated may offer a more effective incentive.

Widespread but poorly regulated and unsafe use of pesticides in developing countries such as Nigeria coupled with the absence of adequate worker education and effective regulatory measures has led to concern about the impact of these pesticides on public health and in particular the exposure and poisoning of farmers and farm workers. For these farmers and farm workers, the consequences of the pesticide treadmill are high indeed as many of them cannot read pesticide warnings and instructions. Living accommodation for farm workers are often poor, lacking in toilet and washing facilities, and situated close to the field, thereby exposing them to the hazards of pesticides.

Only limited research has been done on farmer and farm worker safety issues in Nigeria. Research on regulatory incentive systems that may induce government and manufacturers of pesticides to protect farmers and farm workers from pesticides related harm is particularly sparse.

Thus a study of this kind is necessary to update the findings of previous works notably that of Fajewonyomi (1995) so as to curtail hazards faced by farmers and other farm workers through the overuse, misuse or abuse of pesticides.

This study results will go a long way in assisting farmers, agricultural workers and other users of pesticide as well as government policy makers to find ways of ameliorating or minimizing the health hazards faced by these occupational group whose contributions to the nation's economy are so significant.

The objective of this study is to investigate all the pesticides in common use in cocoa agriculture, the possible dangers associated with their use and established regulatory incentives (if any) that protect farmers and farm workers against pesticide risk.

MATERIALS AND METHODS

The study is conducted in Ondo state in Southwestern Nigeria which is the largest cocoa producing state in the country; hence a majority of the inhabitants are involved (directly or indirectly) in cocoa farming.

Interviews for the farmers and farm workers were carried out in Idanre Local Government area because of the prominent position it occupies in the production of cocoa in the state. Idanre local government area is made up of more than 400 out of which twenty – two villages were purposively sampled for this study. However, simple random technique was used in selecting the farmer and farm worker respondents. The pesticide-marketing respondents are located in various towns of the state such as Idanre, Akure, Ondo and Owen. A total of fifty farmers, fifty farm workers and thirty-two pesticide marketing agents were interviewed.

The data were collected in December 2000 using structured questionnaires. For farmers and farm workers who are illiterate, the questions were translated into Yoruba language for them to understand and all the required information was recorded on copies of the questionnaire during interviews.

Meetings preceded the administration of the questionnaire with secretaries of the farmer's cooperative unions in each village or region to explain the rationale for the study and to solicit the cooperation and responsiveness of their members. The pesticides marketing agents' questionnaire was administered by locating them through their contact addresses around the state.

The Federal Environmental Protection Agency zonal office at Ibadan was contacted for information on Government efforts regarding the monitoring and regulation of pesticide production, importation, distribution, use and disposal in effort to protect users as well as the Nigerian environment from the adverse effect of pesticides.

From both categories of respondents (farmers and farm workers), data were collected on type of pesticide used, sources of information about pesticides, training in the proper use of pesticides, belief in the washing of clothes after spraying, storage of pesticides as well as disposal of empty containers.

Furthermore, information was collected on the kinds of symptoms encountered during or

after spraying, treatment for each kind of symptom as well as the incentive system or compensation being offered by manufacturers to farmers and by farmers to farm workers to protect them from pesticides.

From the pesticide-marketing agents, information sought includes their experience in pesticide marketing - kinds of pesticides (registered or unregistered) and spraying equipment marketed. Others are information contained on pesticide labels and whether these marketing agents encourage pesticide users to practice pesticide use precautions, as well as efforts and incentive/compensation to protect farmers and farm workers against any hazard associated with pesticide usage.

The data were analyzed using descriptive statistics (frequency distribution, percentages, proportion, mean and modes).

RESULTS AND DISCUSSION

This section which discusses the major findings from the three categories of respondents - farmers, farm workers, marketers of pesticides and the Federal Government of Nigeria regarding the safe use of pesticides is divided into three sub – sections namely:

- i. Socio – economic characteristics of farmers and farm workers
- ii. Characteristics of pesticide marketers
- iii. Efforts of the federal and state governments of Nigeria regarding the protection of pesticide users as well as the Nigerian environment from pesticide hazards

Socio-economic Characteristics of Farmers and Farm Workers: Majority of the farmers and farm workers are male. Only 6 (12%) of the farmers interviewed are female while the remaining 44(88%) are male. Sex distribution of the farm workers indicates that more women (24%) are involved in other farm works relative to pesticide application. More of the male farm workers are involved in pesticide application on cocoa farms compared to the female. The mean and modal ages for farmers are 51 and 57 years respectively while comparable figures are 48 and 45 years for farm workers.

Literacy level is related to levels of awareness and practice for the pesticide use precautions. 72% of the farmers interviewed are literate while the remaining 28% are not. Of the 36 farmers that are literate, 63.9% claimed they can read or

write in Yoruba language while the remaining 13.9% read or write in English language only. 82% of the farm workers are literate, but only 56% of these can read or write either in English or Yoruba or both. This low level of education reported by both farmers and farm workers must have contributed immensely to their low level of awareness and their unsafe use of pesticides in their cocoa farm operations.

About 58% of the farmers had over 20 years experience in cocoa farming. However the frequency (36%) is lower for farm workers. This shows that though most of the farmers and farm workers had little or no formal education they make up for this inadequacy by the skill they have acquired over a long period in cocoa farming.

The mean farm size is 3.32 hectares while the modal class is 0-2 hectares; hence most of the farmers are small holder producers.

Majority of the farmer respondents (88%) employ labourers/farm workers in their cocoa production. Of the 44 farmers that employ labourers/ farm workers, 61.44% offer them accommodation. The mean number of hired hands on a farm is 3. The farmworker respondents indicated that they perform different kinds of work on the cocoa farm, however majority are involved in cocoa spraying.

About 96% of the farmers use pesticide on their cocoa farms. The eight pesticides being used by the farmers and farm workers during this study are classified either as "highly hazardous" or "moderately hazardous" (UNEP/ILO/WHO, 1992). Greater percentage of the farmers uses Gammalin 20 because it is rated by the World Health Organisation (WHO) as being moderately hazardous.

Use of Gammalin 20 is closely followed by the use of Copper sulphate, Basudin and Aldrex 40. All these pesticides belong to a group of pesticides popularly listed as the "Dirty Dozen" (Pesticide Action Network, 1993) and have been banned, severely restricted or unregistered in some countries in view of their known hazards to human and environmental health.

46% of the farmers and 44% of the farm workers using pesticides obtained knowledge of pesticide application from extension agents in the area. The rest of the farmers obtained their knowledge from parents (31%), other farmers (18%) and relations (42%). As high as 56% of the farm workers obtained theirs through their

employer and relations. There is however, the likelihood that knowledge might be distorted if it is received from other farmers or farm workers and relations and not the experienced extension agents.

Cocoa pesticides are packaged in bags, plastics containers and metal containers. A majority of the pesticides are packaged in metal and plastic containers. Unfortunately most farmers wash and rinse these metal and plastic containers for other purposes such as storing palm oil, food grains etc.

98% and 96% of the farmer and farm workers respectively say pesticide instruction and warnings are written in English. As a result of this, farmers who cannot read or write in English have it read to them. Few pesticides have their instructions written in Yoruba whereas majority of the farmers can only read or write in Yoruba. Other languages in which instructions and warnings are written include French and Arabic.

64% of the farmers and 58% of the farm workers had training in pesticide application or use of spraying equipment, principally through other farmers in the case of farmer respondents and from employers in the case of farm workers. About 90% of the farmers service their spraying equipment regularly. Of these, 42.9% (21 respondents) handle it themselves while 30.6% (15 respondents) employ the services of spraying equipment repairers. Most of the farm workers interviewed service the spraying equipment themselves. It was noted that farmers and farm workers who service the spraying equipment themselves do so without wearing protective apparels (such as gloves, boots e.t.c.). Some blow the spray nozzle with their mouth in attempts to dislodge the objects causing the blockade. This practice exposes them to poisonous doses of pesticide

Majority (87.5%) of the farmers kept their pesticides in stores. 8.3% kept theirs in the bedroom while the rest kept them in bedrooms, the sitting rooms or kitchens.

Storing or keeping pesticides in any place other than stores located on farms or far away from living areas exposes users and non-users (most especially children) to hazards associated with these pesticides. Farmers indicated that they disposed of pesticide container by burying (25%), burning (10.4%) throwing into refuse heaps (2.1%) and selling to buyers (25%), however majority of them (35.4%) washed their pesticide

containers for other uses such as storing palm oil. Such practice poses health hazards to the farmer and his family because several traces of these pesticides could still be found in the containers after washing. Similar methods of disposal are indicated by the farmworker respondents.

About 80% of both farmers and farm workers indicated that they experience discomforts such as such as headaches, tiredness vomiting, nausea, and skin problems (itching and skin burn) after spraying. 57.5% of farmers who health experience discomforts after spraying reported the symptoms to the marketers of these pesticides. 37.1% of the farmers claimed that the marketers showed little or no concern about provision of incentive or compensation after reporting unusual symptoms resulting from pesticide use.

70% of the 39 farm workers experienced discomforts after spraying indicated that their employers did not offer them compensation when these symptoms are reported. 30% however said that they are given compensation in form of money grants and provided protective clothing. The proportion of farmer respondents that wore protective materials, gloves, boots and goggles when applying or mixing pesticides, were 68% 56%, 54% and 40% respectively while comparable figures for farmworker respondents were 64%, 52% 36% and 18%. These proportions were low considering the enormous hazards they face if they ignore these precautions. Some respondents said they do not put on goggles and boots because they will not be able to see well nor do they wear boots which would be heavy and uncomfortable.

Various proportions of the farmer respondents follow post-spraying health protection operations: 68% washed clothes after spraying, 60% did not use empty containers for food or water, 90% did not allow children to play with pesticide containers and 62% did not wash clothes used in spraying among other clothes; comparable proportions of farmworker respondents are 72% 62%, 88% and 48% respectively.

Low proportion of the farmers (44%) and of farm workers (34%) followed the instruction on the direction of wind to face when spraying chemical pesticide. Reasons given for this by some respondents are that this information was not on the label and as such it was not considered necessary. 78% each of the farmers and farm

workers said they do not eat or drink while spraying. The rest who eat or drink while spraying do so to generate energy when they are feeling tired.

Characteristics of the Marketers: The mean year of experience in pesticide marketing is 20 years and the modal range is 10-19 years. Marketing of knapsack sprayer shows the highest frequency followed by hand sprayer. This indicates that knapsack sprayer is the commonest kind of spraying tool demanded and used by cocoa farmers.

Pesticides commonly handled by marketing agents are Gammalin 20, Aldrex 20, Perenox, Cacaobre Sandoz, Copper sulphate, Basudin, Thionex and Uden. Majority of the marketing agents interviewed markets Gammalin 20 closely followed by Copper sulphate. In addition to belonging to the list of the "Dirty Dozen" (PAN, 1993), Watterson (1988) reported that toxic poisoning symptoms of Gammalin 20 include eye, nose and throat irritation, headaches, nausea, blueness of lips, skin irritation and aplastic anemia. Ordinary occupational use of Copper sulphate can cause itching, eczema, conjunctivitis (on contact with eye) and pneumoconiosis. High levels cause kidney and liver damage. This demonstrates lack of concern by relevant government agencies for the health of our rural populace, cocoa farmers and farm workers.

57% of the marketing agents said there is restriction on the sale, and use of some of the cocoa pesticides marketed by them. Majority (87.5%) claimed that Gammalin 20 is fully registered while lower percentages were recorded for Perenox and Thionex and Uden. All the marketers interviewed indicate identification, that is, trade name, category of pesticide (whether insecticide, nematicide, fungicides e.t.c.) but majority (59.4%) did not indicate hazards associated with pesticides. Lowest percentage of 40.6 was recorded in the label content indicating the hazards, which the pesticide presents.

93% of the respondents interviewed write instructions and warnings on pesticide labels in simple sentence which can be easily understood by the users. 65.6% of the respondents claimed that users read and adhered strictly to these instructions and warnings. While the rest indicated ignorance about it.

In respond to the question about what the

marketers are doing to safeguard the health of their customers, 46.9% of the respondents indicated that they made efforts in this direction against the 53.1% that did not. The activities of the marketers therefore need be looked into by the government or its regulatory agencies to ensure that safety measures are taken to protect farmers/operators from harms caused by pesticides.

Only 25% of the respondents offered incentive or compensation to users harmed as a result of exposure to pesticides when properly used. This is in the form of money grant or provision of drugs or protective materials or less hazardous alternatives.

Efforts of the Federal and State Government of Nigeria Regarding the Protection of Pesticide Users and the Nigerian Environment from Pesticide Hazards: Information available at the Federal Environment Protection Agency indicated that the Federal Government of Nigeria recognizes the problems of pesticides use and has put in place legal and administrative procedures aimed at regulating and monitoring pesticide manufacture, importation, distribution, use and disposal so as to protect users as well the nation's environment from the effects of these pesticides. These include:

Guidelines on Pesticide Management: Guidelines were developed to assist importers, transporters, formulators, marketers, distributors, users and the general public to adopt the principles of environmental and friendly use of pesticides. Under this guideline standards are set to ensure that pesticide use are compatible with the overall goals of bequeathing a clean and safe environment to Nigerians.

The National Chemical Tracking Programme: The programme is aimed at monitoring and control of hazardous chemicals (pesticides inclusive). They are expected to be monitored from importation to local production, storage, transport, sale and distribution, use/handling and disposal in order to minimize dangers to human health and the environment. Under this programme, chemicals (pesticides inclusive) imported into the country should undergo physical examination, sampling and laboratory analysis for authenticity prior to release.

Standing Committee on National Chemicals Management Control Actions: The committee was set up to advise government on pesticide import. In taking decisions, it considers the

concern of various stakeholders and the safety status of the chemicals in Nigeria. The committee is charged with the responsibility of recommending national control actions on importation of chemicals and pesticides.

National Inventory of Obsolete Pesticide Stocks: The Federal Ministry of Environment in collaboration with relevant stakeholders recently completed a national survey of obsolete pesticide stocks in Nigeria as first step towards the prevention of future stockpiling of obsolete pesticides.

Pollution Abatement in Industries and Facilities Generating Wastes Regulations of 1991:

This regulation imposes restrictions on the release of toxic substances and stipulates requirements for monitoring of pollution to ensure that permissible limits are not exceeded.

The Chemical/Pesticides Registration Programme: The programme requires all importers of potentially toxic industrial chemicals, agricultural chemicals and ozone depleting chemicals to apply for an annual import permit. The hazardous substances being controlled under this programme are mainly those used in large volumes for industrial, agricultural, spill clean up and or commercial purposes which usually end up in wastes discharged into the environment. The application and discharge of this category of substances affect the quality of air, water and land thereby exposing humans, animals, plants, and microbes to risk.

Public Enlightenment and Training Programmes: The Federal Ministry of Environment and other regulatory bodies organize periodic training workshops to catalyze and the coordinate activities related to pesticide management, and educate relevant sectors in pesticide usage and handling thereby protecting public health and the environment through increased awareness of pesticide associated risks and strategies for managing them.

Efforts to revise the pesticide regulations as well as work on how to effectively enforce and implement the programmes mentioned above are in progress.

At the Oyo State Environment Protection Agency (OYOFEPA), there is no specific regulation, action, legal or administrative procedures and mechanisms to protect users as well as the environment from the hazards associated with pesticide use except a section in the agency's edict which says "No person shall use Gamma-

lin 20 or any herbicide, pesticides, insecticides, explosive or any other chemical to kill aquatic animals or for any other purposes in rivers, lakes and streams" (Oyo State Environment Protection Agency, 1999).

SUMMARY AND CONCLUSION

The foregoing has shown that the major pesticides used by farmers and farm workers in the study area in combating the effects of pests and diseases on their cocoa farms include: Gammalin 20, Aldrex 40, Perenox, Cacaobre Sandoz, Copper sulphate, Basudin, Thionex and Unden. Analysis shows that farmers are not taking the necessary precautions to prevent hazards associated with their use. Farmers and farm workers suffer from discomforts ranging from headaches, tiredness, vomiting, and nausea to skin problem such as skin burn and itching after using these pesticides. The low level of education of users coupled with lack of formal training in pesticides use and the fact that some of these pesticides do not carry labels and information from their manufacturers in the language of these end users expose the farmers and farm workers to the hazards.

Majority of the farmers reported that the marketers of these pesticides offer them no incentive or compensation to protect them from pesticides hazards. Majority of the farm workers reported that their employers (farm owners) show little or no concern about the provision of incentives or compensation to protect them from the hazards of these pesticides.

Result also reveals that most of the cocoa pesticides in use are classified as "highly" or 'moderately' hazardous by the World Health Organization and have been banned or restricted in many economically advanced countries. Contrary to this, most of the marketers claimed that the pesticides they market are registered in Nigeria and do not present acute health hazards to users, by-standers, livestock, wildlife, and environment in general. Few of the pesticide marketers also coordinate efforts to plan, prepare and disseminate educational materials to protect farmers, farm workers and other users against any hazard associated with pesticide use.

The Federal Government of Nigeria through the Federal Environmental Protection Agency recognizes the problems of pesticide use and has put in place legal and administrative procedures

to protect users as well as the nation's environment from the adverse effects of pesticides. These include Guidelines on Pesticide Management, The National Chemical Tracking Program, The Chemical /Pesticide Registration Programme, the Standing Committee on National Chemicals Management Control Actions, National Inventory of Obsolete Pesticide Stocks as well as training and enlightenment programmes on pesticide use. Work on effective monitoring, enforcement or implementation of these procedures and mechanisms is not being pursued with the seriousness required.

Following from above, the following is suggested:

- i. Extension services need be greatly improved by both public and private agencies to increase necessary awareness among pesticide users so as to encourage right practice for the safe use and handling of chemicals and pesticides by educating them on the risks involved in the wrong use of these poisonous materials.

- ii. Intensification (by the Federal Environment Protection Agency) of efforts aimed at pesticide registration and control with a view to categorizing them according to their safety status and banning hazardous ones from use. Strict enforcement of these regulations through appropriate law enforcement agencies should also be initiated and maintained.

- iii. Chemical and pesticide manufacturers/marketers must be compelled to exhibit instructions and warnings on pesticide labels in the commonly understood languages of the end users. (e.g. English, Hausa, Igbo Yoruba, Pidgin English)

- iv. Government effort in protecting pesticide users should include appropriate regulations that compel manufacturers or their marketing agents to offer incentive or compensation to users harmed as a result of exposure to pesticides when properly used. 'Properly used' in this context means that users read and adhere to warnings and instructions on pesticide labels. Such effort should also include the establishment of regulatory incentives or compensation that compel or induce farmers or employers of farmworkers to protect farm workers from pesticide related harm. Davis et al (1992) stated that such policy or regulation could be ex post regulation via tort liabilities and workers compensation system respectively and ex ante regulation (fines) by administrative agencies.

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