Agrosearch (2014) Volume 14(1):1-13 http://dx.doi.org/10.4314/agrosh.v14i1.1

PESTICIDES USE AMONG GRAIN MERCHANTS IN MUBI GRAIN MARKETS OF ADAMAWA STATE, NIGERIA

Dahiru, B[1]., Abdullahi, G[2]. and * Bukar, N[3]

[1,3] Department of Agricultural Technology, Federal Polytechnic, P. M. B. 35 Mubi, Adamawa State Nigeria.

[2] Department of Crop Protection, Modibbo Adama University of Technology, P.M.B.2076 Yola, Adamawa State Nigeria.

*Correspondence: bukarnuhu@yahoo.com

ABSTRACT

Food security in sub-Saharan Africa largely depends upon improved food productivity through the use of sustainable agricultural practices and the reduction of post-harvest losses caused by pests and diseases. This study was conducted in two major grain markets in Mubi to study pest control practices by grain merchants. Fifty questionnaires were administered to randomly selected grain merchants and laborers through personal interviews from the two main markets between April and August, 2011. The responses of the respondents were recorded. Descriptive statistics was used for data analysis. The result of the study shows that close to half (46%) of the respondents have: low level of education, while (30%) of them have no formal education. The result further shows that the respondents lack technical know-how on how to apply pesticides during grain storage period that ranged from 1-6 months; and the most commonly used insecticides were dichlorvos, permethrin and aluminium phosphate. The implications with respect to pesticide poisoning are food contaminants were discussed accordingly. It is, therefore, recommended that farmers, retailers, distributors and all the pesticide workers should undergo regular training/workshop on the use and safety measures of pesticides. Also multimedia awareness activities in local language should be massively conducted.

Key words: Pesticides, food security, grain merchants, storage, perception.

INTRODUCTION

Food security in sub-Saharan Africa largely depends upon improved food productivity through the use of sustainable agricultural practices and the reduction of post-harvest losses caused by pests and diseases (Adedire, 2001). Xiaosong and Weston (1995) reported that, pests and diseases pose the greatest threat to increased food production, storage and handling with insects causing 15 – 100% pre-harvest, and 10 – 60% post- harvest food grain losses respectively. In particular, storage insect pests cause substantial damage to the stored grain (Mvumi and Stathers, 2003). However, Kennedy (1998) pointed out that to ensure high food quality and

standards, which are acceptable to the consumer, quality control, including good storage and handling practices must be observed at all times. Managing stored grains requires the use of various techniques to ensure that the quality of the stored grains does not deteriorate over time. These measures include: the use of sanitation; storing sound, dry grain; managing temperature and aeration; and using chemical protectants, regular sampling, and fumigation (Okori *et al*., 2004).

Pesticides are substances used to kill, repel, or control certain forms of plant or animal life that are considered to be pest (National Institute of Environmental Health Sciences (2013). Pesticides are an important part of food production. According to Okori *et al*. (2004) without pesticides food would be more expensive; because production would require more labor and more intensive, knowledgeable management. For decades, the pest control policy in developing countries has been dependent upon the use of synthetic pesticides (Ogendo *et al*., 2004).

Pesticides are toxic in nature and do not differentiate between target and non-target species of plants and animals, and hence should essentially be subject to safe and judicious use. Due to injudicious and indiscriminate use of pesticides, many accidents have occurred in different parts of the world, and presence of pesticides in foods, fruits, vegetables, and environment and even in mother's milk is a matter of great concern (FAO/WHO, 2005). Of all the pesticides released into the environment every year by human activity, persistent pesticides are among the most dangerous (FAO/WHO, 2005). They are highly toxic, causing an array of adverse effects, notably death, diseases and birth defects among human and animals.

Insecticides are the quickest and most pragmatic means of combating an infestation, but their uses have been restricted in many parts of Africa because of cost and their ability to contaminate the environment, leaving harmful residue in produce and induce resistance in pest species (Lale, 2002). Various chemicals have been evaluated and reported to be effective against major crop diseases and insect pests (Mathews *et al*., 2003). However, according to Mvumi and Stathers (2003), there is a global drive towards reduction in pesticide use and eventual phasing out of synthetic based chemical grain protectants, articulated mainly by consumers and environmentalists who are concerned with health risks and environmental damage.

Huge quantities of grains are stored in Mubi each year and these grains are usually protected with synthetic pesticides as the farmers and traders alike await better price. It is equally a common practice that calendar application of such pesticides are widely practiced by both farmers and traders, this particular practice is capable of increasing pesticide residue accumulation in such stored grains. Similarly, both groups have total disregard and in most cases ignorant on residues in grains even though cases of pesticide poisoning and even death are commonly associated with such usage. Therefore there is need to study the presence of such residues to unearth their residue levels in some stored grains in Mubi. The objectives of the study

are to: assess pest control practices of grain merchants in Mubi markets with a view to reveal unhealthy practice which can lead to food contamination.

MATERIALS AND METHOD

Study area: The study was carried out in Mubi Grain market. Mubi is located in the north eastern part of Adamawa State on Latitude 10 N and Longitude 13 19 E at an altitude of 696 meters above sea level (Adebayo and Tukur, 1999).

Questionnaire administration

Questionnaires were administered between April and August 2011 to the major merchants and laborers of the two major grain markets by personal interviews. A random sampling technique was used to select the respondents. Issues raised in the questionnaires were education level, period of storage, technical knowledge on how to apply the pesticide and the common pesticide used in Mubi. The major constraint faced during questionnaire administration was getting respondents' full attention when they were at work (applying the pesticides). Efforts were made to arrange interview dates with respondents which in most cases were rescheduled several times.

Data analysis and presentation

Data generated was analyzed using descriptive statistics of percentages.

RESULTS AND DISCUSSIONS

Educational background

The results of the educational background of the traders are presented in Figure 1. Majority of the respondents are primary school leavers with 46% and the least are those with secondary and non-formal education background. This implies that illiterates and perhaps uninformed persons represent majority of people trading grains in Mubi. These will definitely reduce the possibility of compliance with dosages and ethical practices with regards to pesticide usages. Education has been reported to be of great influence on the overall behavior and the dispositions of individuals towards adoptions of agricultural related innovation (Ashburner and Friedrich, 2001; Hayes, 1982).

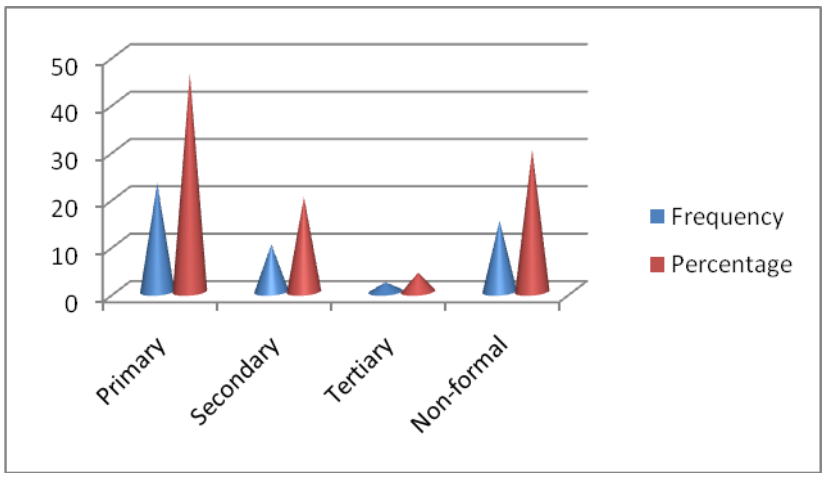

Figure 1: Education background of respondents

Type of grains stored.

The data for the type of grains stored is shown in Figure 2 and the result shows that most of the traders store cowpea (54%), followed by Bambaranut (20%), while the lowest according to the percentage respondents is for sorghum (10%). This implies that the traders preferred storing cowpea grain most likely because of the high returns after a successful storage.

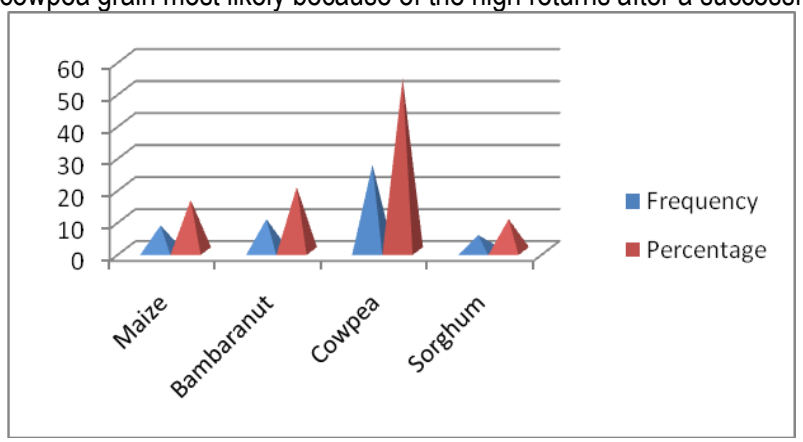

Figure 2: Number and percentage responses for type of grain stored

Purpose of storage

The data for purpose of storage is shown in Figure 3. The result reveals that most of the grains are stored for commercial purpose 96%, which also indicate that maize, Bambaranut, and cowpea are the three most widely stored grains in Mubi (Figure 2), and the storage is mostly

done for commercial purposes(Figure 3). This implies that grains stored by the traders in Mubi will have wider distribution among the populations as these represents the main stable food grains of most countries in Sub-Saharan Africa (FAO/WHO, 1998; Owusu, 2007; Obeng-Ofor, 2007)

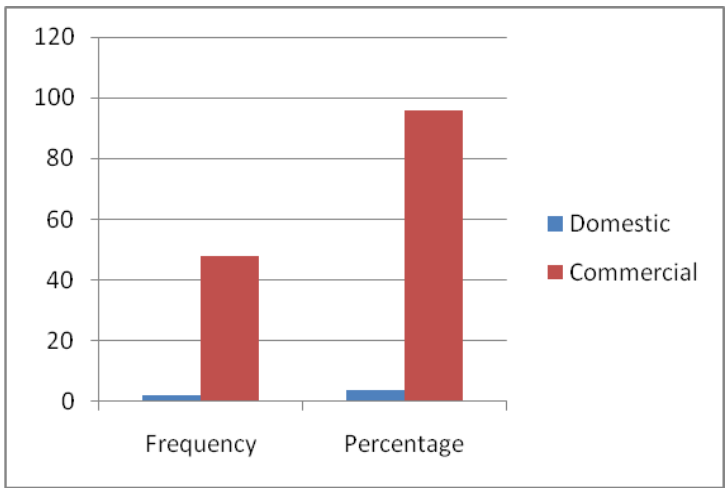

Figure 3: Purpose of storage of grains by respondents

Synthetic Pesticide Used

The data for the kind of pesticide commonly used by traders in protecting stored grains is presented in Figure 4. It shows that most of the marketers use 74% of Dichlorvos (D.D.Force) for protecting their grains. The least pesticide used is cyclone10% .The data further reveals that three insecticidal formulation; permethrin, Aluminum phosphide and Dichlorvos are the most commonly applied insecticides by traders in Mubi for stored grain protection.

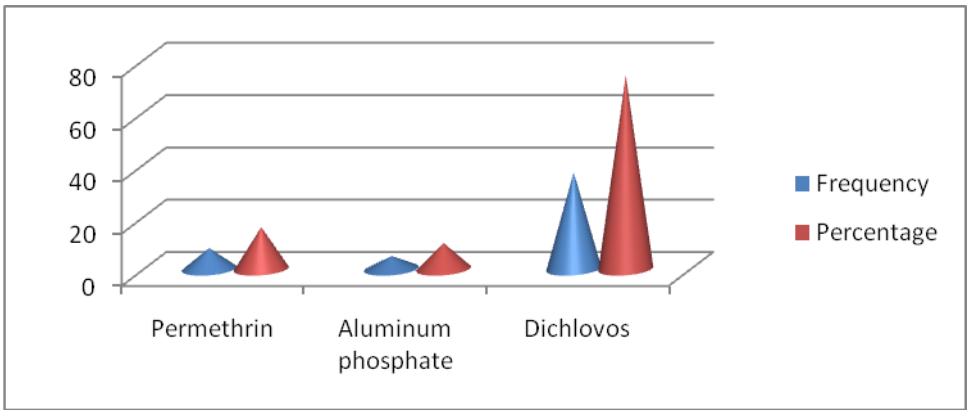

Figure 4: Synthetic pesticide commonly used in Mubi markets

Training background in pesticide application

The result of training background is in Table 1. The result indicates that the traders have never had any formal or non-formal pesticide training or supervision at site of pesticide application. Similarly, the result further revealed that none of the traders and the pesticide applicators had any sort of formal training in pesticide handling and application (Figure 5). Mathews *et al*. (2003), reported similar finding while studying pesticide application in Cameroun. The chances of these pesticides being applied repeatedly on these grains with consequent possibilities of residues development on the grains at levels above their Allowable Daily Intakes (ADIs) for human are also evident. There are also the possibilities of chronic poisoning of the workers and traders alike by these insecticidal groups due to repeated exposures. There is therefore the need for training of the pesticide applicators on stored grains as this will go a long way in addressing FAO concerns for ill health associated with those applying pesticides (FAO/WHO, 1998).

Table 1: Pesticide applications training receive by respondents.

	Frequency	% of Respondents
Yes	0	0
No	50	100
Total	50	100

Place of pesticide application

The result of the place of pesticide application is presented in Figure 5.The result shows that they mostly (90%) operate in open area (public place, parks and market place). Fewer respondents

(10%) apply pesticide in the closed environment during raining season. Similarly the questionnaire result indicates that most applications are done in open space (Figure 7). This will probably reduce the possibility of poisoning especially where necessary pesticides application precautions are adhered to.

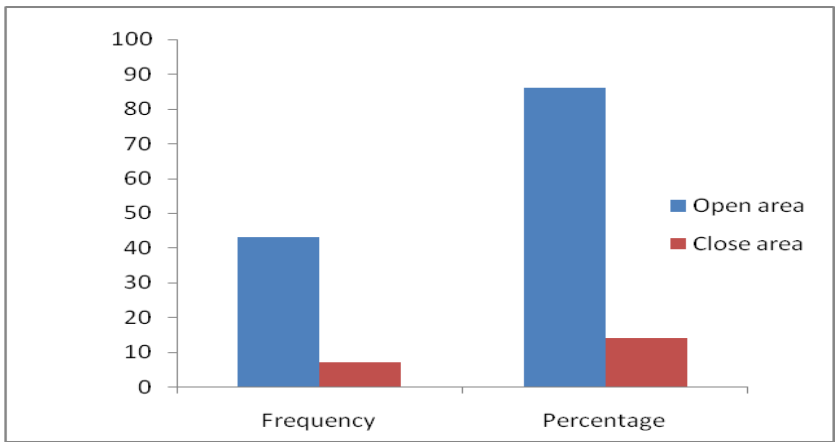

Figure 5: Environment for pesticide application

Protective clothing used during application

The data for using protective clothing during pesticide application is presented in Figure 6. The result shows that none of the respondents used protective clothing during pesticide application. The drawback to achieving this reduction hypothesized above is the fact that, no protective coverings were used by the applicators to reduce contact with pesticides (Figure 8). It could therefore be expected that toxicities from multiple route of exposure, contact, oral or inhalations would increase. Pesticide applications are in general mostly done without protective clothing in most agricultural systems in Africa (Mathew *et al*., 2003).

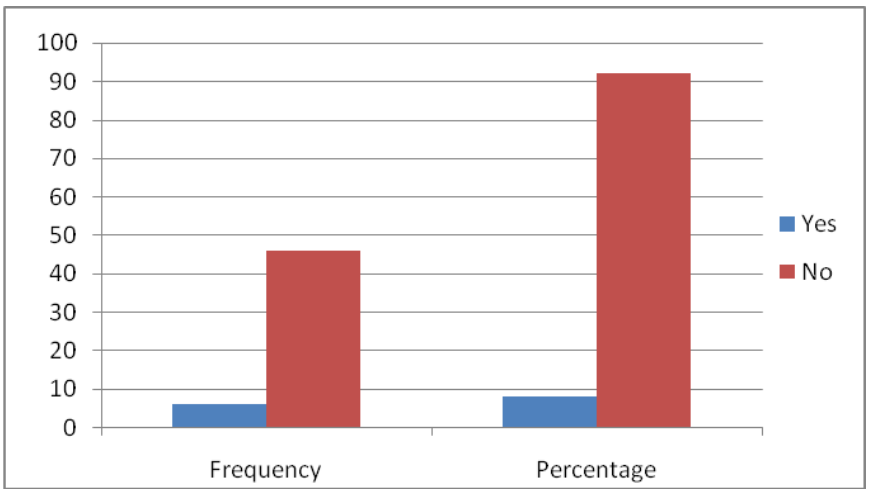

Figure 6: Usage of protective covering during application

Method of pesticide application

The data for method of pesticide application on grains is presented in Figure 7.The result reveals that majority (72%) of the respondents used direct ad-mixture of pesticide liquid formulation with the grain. The least is placement of pesticide in tablet form. In the same vein, the questionnaire result indicate that the pesticides are mostly applied to the grains directly as mixtures (72%) (Figure 9). This further cements the fact that multiple routes of contaminations are possible.

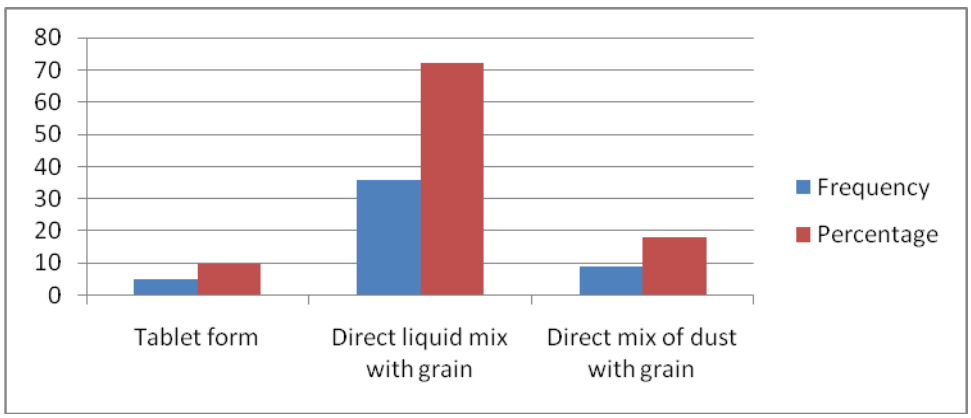

Figure 7: Mode of pesticide ad-mixture with grains

Side effect ever experienced as a result of pesticide application.

The data for side effect experience as a result of pesticide application is presented in Figure 8. Most of the respondents indicated ever experiencing one of the three symptoms listed. The majority (76%) experience headache and others indicated rashes and skin burn for a short time. Indications of possible toxicities to traders by these pesticides are demonstrated in Figure 10, where it was evident that all respondents had experienced some sort of reactions due to exposures to pesticides. Reports of ill health due to pesticides exposures have been documented. FAO/WHO (1998) and WHO (1986), estimate that about a million people are being poisoned by pesticides annually with 20, 000 cases resulting in death. Most of these toxicities and fatal consequences are through pesticides used by small-scale farmers without adequate knowledge acquired through formal training and failure to wear appropriate clothing (FAO, 1993; WHO, 1996; Mathew *et al*, 2003).

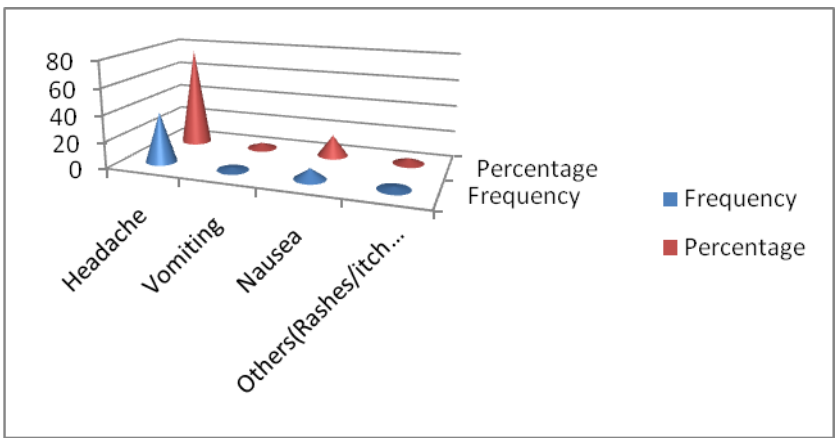

Figure 8: Side effects of exposures to pesticide

Length of Storage Time of the Grains

The data for period of storage are given in Figure 9.Most (46%) of the traders store grains for 1 month and others or less than a month from time of pesticide application, depending on market situation. The fear of toxicities as seen in this particular study will be further exacerbated by the fact that majority of the grains are kept in storage for short period i.e. 1 months (Figure 9). This implies that reasonable quantities of such pesticides may remain on the produce at the point of re-sale to the consumers. This will increase the danger of increased accidental ingestions of such pesticides by the consumers, processors and to lesser extent by the traders during handlings at the point of re-sale.

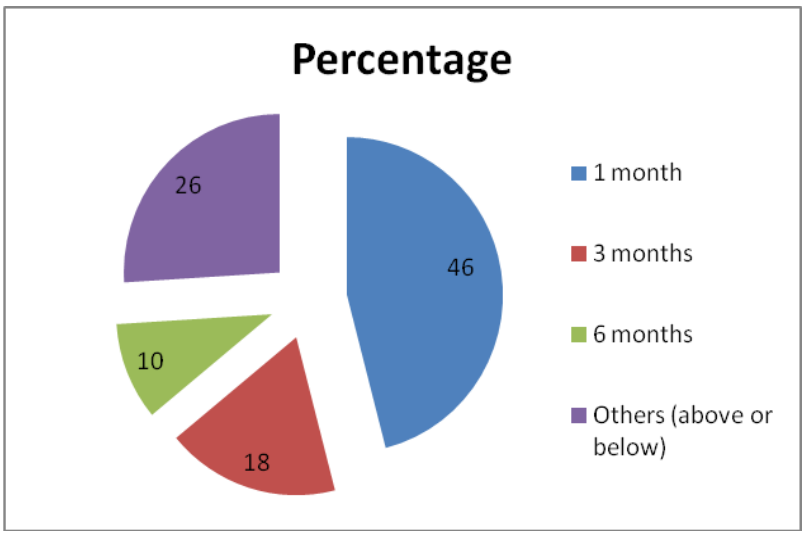

Figure 9: Grain storage period by respondents

Method used in Determining Presence or Absence of Pesticide in Grains

The data for the method used to determine the presence or absence of pesticide is presented in Figure10.The data indicates that most of the respondents use observation and smell of their stored grain as an indication for the presence or absence of pesticide on grains. It was equally evident from the questionnaire result that traders use crude ways to establish the presence or otherwise of the pesticides on the treated grains. Majority (Figure 10) used mere observations (70%) and smelling/odour (30%). This implies that traders consider the grains to be fit for re-sale and therefore safe for consumption if they no longer spot traces of applied chemicals on the treated grains and to lesser degrees if they do not perceive the odour of the pesticidal materials on same. There is no due regard for waiting period viz-a-vis the dosages applied with no reasonable allowance, made for effective biodegradability of these products to less harmful constituents (Lale, 2002).

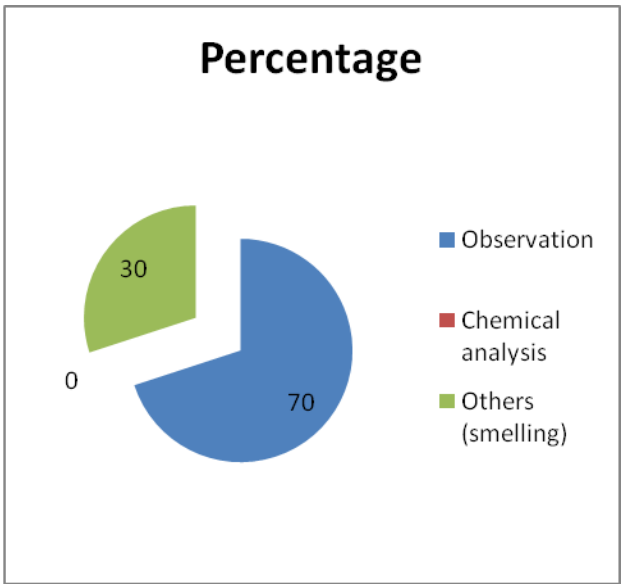

Figure10: Methods of detecting pesticides on treated grains

CONCLUSION AND RECOMMENDATION

Farmers or producers of agro-food products should follow good agriculture practices, which takes account of proper use of certified chemicals within the approved amount or limited dose. The misuse and abuse of such chemicals increase the resultant residues problems in food products as well as environmental pollution. Considering the benchmark of GLOBAL GAP, IPM, the tool to help farmers to get rid of pesticides, should be implemented to the field level with intensive programs. Pesticide residues are arising a prominent issue on the food safety and environmental pollution. In order to minimize the envisaged residue problem in foods as a result of poor ethical practices by grain handlers as shown by this study and guarantee food trade in the international market, a national pesticide residues monitoring program should be implemented in all grain markets in Nigeria. There should also be a coordinating team of Public-Private partnership for close monitoring of appropriate use of pesticides at the field level.

Farmers, retailer's distributors and all the pesticide workers should undergo a regular training /workshop on the use and safety measures of pesticide. Also multimedia awareness activities in local language should be massively conducted.

REFERENCES

Adebayo A.A. and Tukur A.L. (1999). Adamawa State in maps. 1st edition Praclele Publishers, Yola, Nigeria. Pp122.

Adedire, C.O. (2001). Biology, Ecology and Control of Insect Pests of Stored Cereal Grains. In: *Pests of Stored Cereals and Pulses in Nigeria-biology, ecology and control* (ed) Ofuya, T.I. and Lale, N.E.S. 174 pp. Nigeria: Dave Collins Publications.

Ashburner, J. and Friedrich, T. (2001). Improving handling of pesticides application equipment for the safety of applicators. ***Pesticides Management West Africa*** 2:9 – 11

Food and Agricultural Organization (1993). Report and papers presented at the Seventh FAO expert consultation on Fish Technology in Africa, Saly-Mbour, Republic of Senegal, ***FAO Fisheries Report*** 712: 1-179.

Food and Organization/World Health Organization (1998). Pesticides application: http://www.fao.org/ag/AGS/agse/activity.htm.

Food and Organization/World Health Organization (2005). Food Safety Risk Analysis, Part II, Case Studies, Food and Agricultural Organization of the United Nations (FAO)/ World Health Organization (WHO).

Hayes, W. J. (1982). Dichlorvos: Organic phosphorus pesticides. In: *Pesticide Studies in Man*. pp. 343-351. London: Williams & Wilkins, Baltimore.

Kennedy, I. R (1998). Biodegradation and plant protection from herbicide 2, 4-D by plant Microbial Association in Cotton. PP 30-41

Lale, N. E. S. (2002).*Stored products entomology and acarology in Tropical Africa.* Nigeria: Mole Publication Limited. Pp 124-147.

G.; Wiles T. and Balequel P.(2003). A survey of pesticides application in Cameroun. ***Crop protection*** 22: 707-714.

Mvumi,B.M and Stathers,T.(2003). The Ecology of stored grain insects in Zimbabwe and their x control using diatomaceous earth with particular reference to grain moth. Natural Resources Institute, University of Greenwich, Chatham.

National Institute of Environmental Health Sciences (2013). Pesticides http://www.niehs.nih.gov/health/topics/agents/pesticdes/

Obeng-Ofor D. (ed.) (2007). *Major pests of food and selected fruit and industrial crops in West Africa*. Ghana: City Printer. Pp 81.

Ogendo,D.W and Hagstrum.B.H.(2004). *Alternatives to pesticide in stored products IPM.* Norwell, Massachusetts: Kluwer Academic Publishers. Pp437

Okori,.P., Rubaihayo.P.R., Adipala.E.,,Fahlesion, J.& Dixelium,C.(2004). Population studies of fungal plant pathogen; perspectives for control with specific reference to grey leaf spot. ***Africa Crop Science Journal*** 12(4): 243-249.

Owusu,E.O.(2007). *Major pest of Cereal grains and their management: Industrial crop in West Africa*. Ghana: City Printers. Pp43.

World Health Organization (1986). Informal consultation on planning strategy for the prevention of Pesticides poisoning WHO, Geneva WHO/VBC/86.926.

World Health Organization (1996). Pesticide residues in food - 1996. Toxicology evaluations. Joint meeting of the FAO panel of experts on pesticide residues in food and the environment and the WHO expert group on pesticide residues. Geneva, 20-29 September, 1996.

Xiaosong, G. and Weston, P. A. (1995). Oviposition and feeding deterrents from Chinese pricky pricky ash against Angoumois grain moth (Lepidoptera: Gelechidae). ***Journal of Economic entomology*** 88:1771-1775.