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AWARENESS AND USAGE OF PESTICIDES IN SELECTED LOCAL GOVERNMENT AREAS OF NASARAWA STATE, NIGERIA

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ABSTRACT

Concerns on pesticides application and their possible threats to public health is alarming. Unfortunately, no part of the population is completely protected against the potential serious health effects. The study therefore investigated the level of awareness on pesticides including their various usages with a view to reduce health hazards and environmental pollution. Multistage sampling technique was adopted to carry out the study. At first stage, five Local Government Areas were purposively selected in Nasarawa State. Five villages and their markets were later purposively selected from the five local government areas. Structured questionnaire was used to elicit information with the use quota sampling technique from Crop farmers (130), Hunters (44) and Bushmeat sellers (36). The awareness on pesticide usage was 100.00% among Crop farmers, 90.90% for the hunters and 86.10% for bushmeat sellers. Pesticides were used for different purposes which include; control of weeds; insects, rodent and pest. Continuous use of pesticides may leave residues and its bioaccumulation in the environment could pose harm to living organisms. There is need to increase the awareness onthe use of pesticides, encourage selective production that is safe to non-target organisms, ensuring strict regulation and control of pesticide usage for conservation of biodiversity.

Keywords: Pesticide residue, Environmental toxicology, Conservation, Biodiversity

Introduction

Pathak *et al*. (2022) define pesticides as chemical compounds that are used to eliminate insects, rodents, fungi, and weeds. These pesticides include insecticides, herbicides, nematicides, fungicides, molluscicides, rodenticides, plant growth regulators, and other compounds (Zhan *et al*., 2020; Bhatt *et al*., 2021; Zhang *et al*., 2021). In the views of Mieldazys *et al*. (2015) and Sharma *et al*. (2019), they are generally used to protect crops, preserve food and prevent vectors which spread illnesses. Pesticides are poisons intentionally dispersed in the environment to control pests, but they also act upon other species causing serious side effects on non-target species and are known to be toxic to man (Ademoroti, 1996). They are used as substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport (Ogamba *et al.*, 2013). The term applies to various pesticides such as insecticide, fungicide, herbicide and nemat ocide (US Environmental, 2007). Omonona *et al.* (2015) reports that the use of pesticides in agriculture is worldwide leaving traces to quantifiable amounts of chemicals in the environment with possible deleterious effects.

The use of chemicals in modern agriculture has not only significantly increased productivity but also has increased the risk of pesticides toxicity in food and in our environment, with associated negative effects

on human and animal health (Babarinsa *et al*. 2018). Humans and animals are occasionally and unintentionally exposed to lethal and sub-lethal doses of pesticides (Martin, 2003). Their direct exposure to pesticides could occur as a result of inhalation, ingestion, dermal and ocular contact. These threats to health vary not only because of the degree and the type of exposure but also indirectly by the pesticide residues embedded in most food consumed (Bassil *et al.*, 2007). Wildlife species dwelling close to farmlands may feed on crops and vegetations which may be exposed to pesticides thereby resulting to acute toxicity (Henriques *et al.*, 1997). Blankson-Arthur *et al.* (2011) are of the opinion that there are evidences showing hunters in their pursuit to make higher incomes are now resorting to baiting game with highly potent chemical pesticides.

Pesticides are persistent and mobile thus can re-enter the land through precipitation and leaching, forming residues in crops (EPA, 2009). The environmental impact of pesticides' use can be huge and several species including fishes and other aquatic creatures have experienced reduction in procreation and increased mortality as a result of pesticides' poisoning. The populations of numerous wildlife species have undergone a precipitous decline, Omonona and Jarikre (2015) attributed this to habitat loss and over exploitation resulting from unregulated pesticide uses. The adverse effect of pesticide use has therefore led to wildlife distress, disruption with reproduction, birth defects as well as depressed immunity, which negatively affect wildlife numbers and the ecosystem as a whole (Fianko *et al*., 2011). Past records from the World Health Organization and the UN Environment Programme as cited by Miller (2004) reveals that in a year, about 18,000 farmers in under developed countries die out of about 3,000,000 farmers that work with pesticides.

It is obvious that pesticides contamination is on the increase as a result of its usage for different purposes. There is no gain saying that the uses of pesticides have short term and long term effects on man and biosphere. Efforts should be geared towards bringing to the minimum level possible the incessant negative effects. This study therefore investigated among selected stakeholders (Crop farmers, Hunters and Bushmeat sellers) the awareness level of pesticides and their usage with the view to reduce their misuse, abuse, adverse effect and preserving biodiversity.

Materials and Method

Study Area

Nasarawa State is situated amid latitudes 8°34´ and 13°85´N and longitudes 8°18´ and 31°88´. Lafia is its capital and according to the calculation of NPC (2006), approximately 4,057,038 is the projected population in year 2024. It has 27,137.8 square kilometers of complete land mass (NPC, 2006). The state share borders with the state of Kaduna in the north, the states of Taraba and Plateau in the east, Kogi and Benue in the south, and Abuja-the Federal Capital Territory in the west.

Nasarawa state has 13 local council development areas and numerous languages spoken including among others: Hausa, Kanuri, Eggon, Bassa, Agatu, Alago, Aho, Gwandara and Ake.

Sampling Technique

Multistage sampling technique was adopted to carry out the study. At first stage, five Local Government Areas were purposively selected in Nasarawa State. Five villages with their markets were later purposively selected from

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www.jfrm.org.ng

each of the five local government areas. One market in each LGA and the locality was purposively selected to elicit information from Crop farmers, Hunters and Bushmeat sellers. The wildlife markets selected for this study were Awe, Doma, Mararaba Udege, Kadarko and Lafia main markets located in Awe, Doma, Karu, Keana and Lafia local government areas (Figure 1)

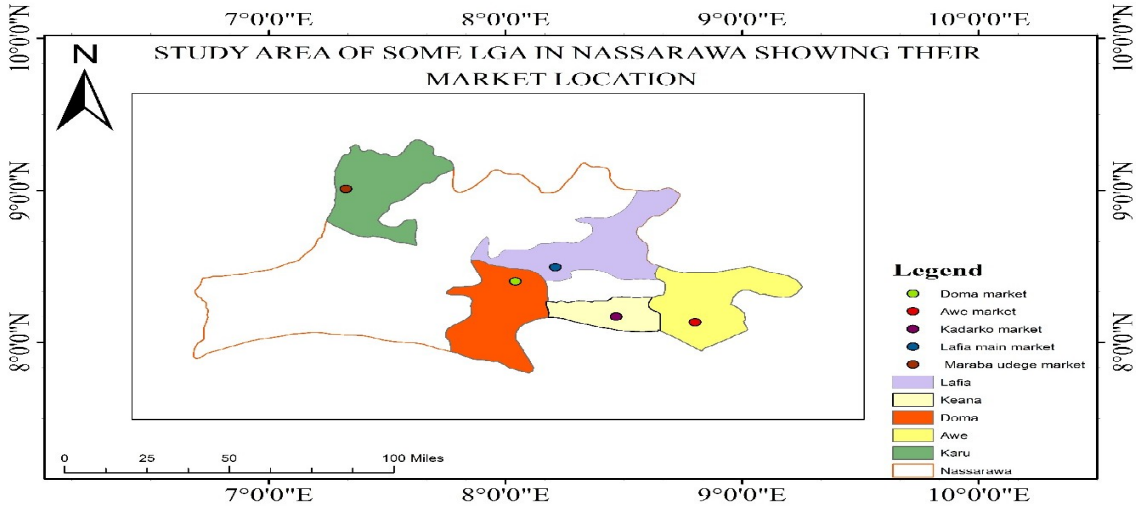


Figure 1: Map showing the bushmeat markets selected for assessment on pesticide awareness and purpose in Nasarawa State.

Sample Size

The sum total of two hundred and ten questionnaires were administered with the use of quota sampling technique. These comprised one hundred and thirty crop farmers, forty four hunters and lastly, thirty six responded for bushmeat sellers.

Data Collection Tools

The population of stakeholders or categories (Crop farmers, Hunters and Bushmeat sellers) in each selected study area varied between tens and one hundreds. In use were both questionnaire and interview schedule instrument. Hence, Diaw *et al.* (2002) was applied (wherever population was less than 100, 30% sampling intensity was used and when population was greater than 100, 10% sampling intensity was used) for sampling and distribution of questionnaire which were randomly administered in the state. Overall totals were considered by calculating scores using Likert scale with simple percentage analysis. The test retest method was employed to obtain the reliability co-efficient of r = 0.75 and content validity was carried out.

Statistical Analysis

Descriptive statistics such as percentages and the frequency for demographic variables were used for the data analysis using the SPSS IBM version 20.0.

Results and Discussion

Survey of Pesticide Awareness and Usage in the Different Ecological Zones

Journal of Forestry Research and Management. Vol. 22 (2). 80-92; 2025, ISSN 0189-8418
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In Figure 2, the awareness level for crop farmers was the highest and recorded 100%. The hunter category ranked second with 90.90% and bushmeat sellers recording 86.10%, respectively.

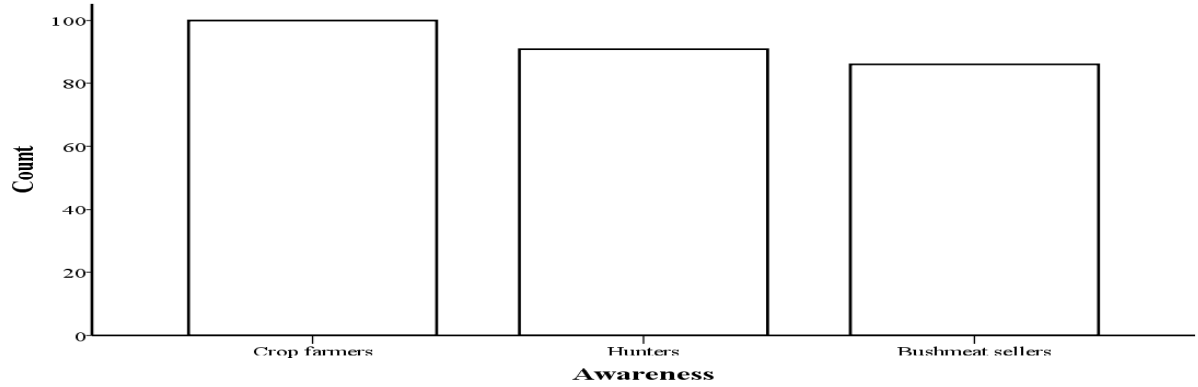


Figure 2: **Awareness Level of Respondents to Pesticide Usage in Nasarawa State**

Pesticides were used for different purposes (Figure 3). Its usage for control of weeds was majorly used by hunters (25.90%) while bushmeat sellers used the least. Also, bushmeat sellers used pesticides more to control insects (60.00%) while hunters used the least. Similarly, 26.90% crop farmers in Nasarawa applied pesticides for both insect and rodent pest control and 11.10% hunters applied pesticides for hunting purposes and rodent control.

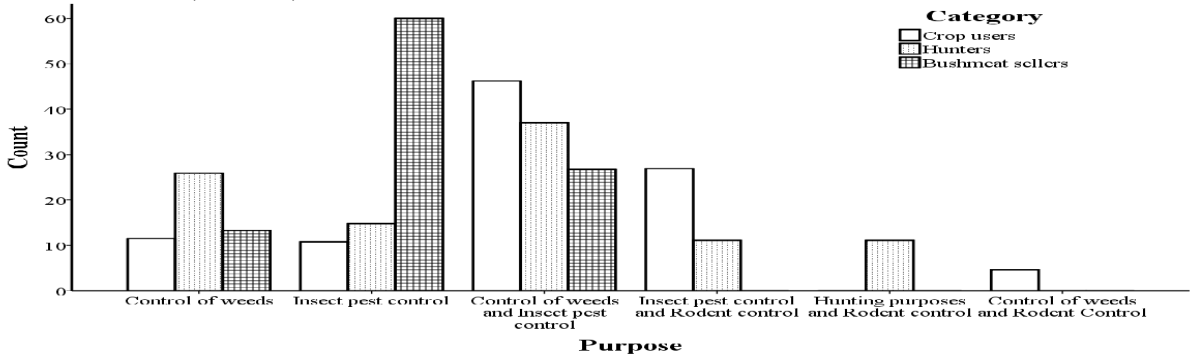


Figure 3: Purpose of pesticide use by respondents in selected Local Governments Areas of Nasarawa State

Socio-economic Features of Respondents in the Selected Study Area

In Table 1, two hundred and ten respondents were assessed in three categories comprising crop farmers (130), hunters (44) and bushmeat sellers (36) in Nasarawa state. The number of males sampled in the population were more than their female counterparts. There was no record obtained for female hunters. Also, all the categories sampled showed that age 31- 40 and 41-50 used pesticides more, while age = 20 in the crop farmers and hunters categories used no pesticides at all. In terms of marital status, the married used the highest number of pesticides among the three categories of respondents.

This was followed by the singles with the value 27.80% for bushmeat sellers, 18.20% divorced hunters and 11.40% widowed hunters. However, the value 5.60% recorded for divorced bushmeat sellers were the lowest values got from the three categories of respondents.

Hunters with secondary school qualification used more pesticides (50.00%) than their counterparts with lower academic qualifications. In the same vein, crop farmers with tertiary institution qualification ranked second with 40.00% unlike 4.60% crop farmers having primary school certificate that used the least pesticides. The resultsshowed that respondents with smaller households for all categories used more pesticides. With the exception of hunters ranging between 21–30 household size and crop farmers between 31-40 household size who had 6.80% and 6.20%, respectively, all other categories within this bracket recorded 0.00%. Respondents with smaller household sizes use more pesticides than larger ones because they may not be able to consume their food at once and there could be a need for preservation. The highest monthly income earned by 65.90% of the hunters was <₦20,000 and was followed by 63.90% of bushmeat sellers earning between ₦20,000 and ₦40,000. Monthly income ranging between ₦81,000 - ₦100,000 and >₦100,000 was neither earned by the hunters nor bushmeat sellers in Nasarawa state but by 6.90% of crop farmers.

Table 1: Socio-economic Features of Respondents in selected Local Governments Areas ofNasarawa State

Variable	Category	Frequency (%)		
		Crop farmers (n = 130)	**Hunters (n = 44)**	**Bushmeat sellers (n = 36)**
Gender	Male	68.50	100.00	94.40
	Female	31.50	0.00	5.60
Age (years)	= 20	0.00	0.00	16.70
	21 – 30	10.80	14.60	27.80
	31 – 40	33.10	29.30	22.20
	41 – 50	33.80	43.90	22.20
	51 – 60	4.60	4.90	11.10
	> 60	17.70	7.30	0.00
Marital status	Single	4.60	11.40	27.80
	Married	79.20	54.50	55.60
	Widowed	10.00	11.40	11.10
	Divorced	6.20	18.20	5.60
Education	Non formal	39.20	33.30	19.40
	Primary school	4.60	9.50	25.00
	Secondary school	16.20	50.00	36.10
	Tertiary	40.00	7.10	19.40

Household size	< 10	40.80	47.70	47.20
	10 – 20	53.10	45.50	52.80
	21 – 30	0.00	6.80	0.00
	31 – 40	6.20	0.00	0.00
Monthly income	< 20,000	5.20	65.90	30.60
	20,000 – 40,000	39.70	27.30	63.90
	41,000 – 60,000	36.20	6.80	5.60
	61,000 – 80,000	12.10	0.00	0.00
	81,000 -100,000	0.00	0.00	0.00
	> 100,000	6.90	0.00	0.00

High awareness level recorded in the study supports the notion that the use of pesticide by the general populace either as agrochemicals or within their homestead or premises is so extensive that it cannot be overemphasized (Mabe *et al*., 2017). Ideally a pesticide must be lethal to the targeted pests, improve productivity and quality, and reduce losses of plants and animals (Warren, 1998; Brown, 2004). Unfortunately, this is not often the case in many developing countries; Nigeria inclusive. The high awareness level is such that the adage “if little is good, a lot more will be better” has played havoc and health threats to farmers, consumers and the entire biodiversity.

This coincides with the statements by Zyuod (2010) and Williamson *et al*. (2008) that even farmers who are well aware of the harmful effects of pesticides are sometimes unable to translate this awareness into their practices. However, Adekunle *et al.* (2017) reports that most farmers were well aware of possible health effects of pesticides and the dangers they could cause to their health and the environment particularly when applied indiscriminately. This has exposed farmers mostly in developing countries to great risk of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate spraying equipment, inadequate storage practices, and often the reuse of old pesticide containers for food and water storage (Asogwa and Dongo, 2009). In addition to these, underrating the instructions on how to use the pesticides and basic safety guidelines on the use of personal protective equipment and fundamental sanitation practices such as washing hands after pesticide handling or before eating are ignored. Evidently, workers who mix, load, transport and apply formulated pesticides are normally considered to be the group that will receive the greatest exposure because of the nature of their work and are therefore at highest risk of possible acute intoxications (Fenske and Day, 2005).Conversely, Fianko*et al*. (2011) and Omari (2014) deduced the abuse of pesticides by farmers in relation to unawareness, health and environmental hazards.

In the study, the use of pesticides for hunting purposes by hunters as deduced by Ogada (2014) dates back to ages in the past. Ogada (2014) stated that poisons which are synthetic pesticides are deliberately used as replacements to kill animals rather than the

known traditional plant and animal based poisons. The killing of wildlife in Africa with pesticides have become one of the most widely used means (Odino and Ogada 2008; Fourie *et al.*, 1996).

Even bushmeat meat sellers who use pesticides to control insects predispose non-target organisms to health hazards (Ogada *et al*., 2012 and Virani *et al*., 2011). Odino (2011); Kahumbu (2010); Fourie *et al.* (1996) asserts that it is illegal and abusive to hunt or use pesticides indiscriminately and recommended that there should be policy enactment and enforcement (Lalah *et al.*, 2011) Adekunle *et al.* (2017) in conjunction with Kishi *et al*. (1995) assert that there is a correlation between the frequency of pesticides exposure and the health challenges pesticides application poses. Research has shown that diverse health conditions ranging from cancer, brain disorders or depression, hormone and reproductive system disruption (Adekunle *et al.*, 2017) could manifest because of continuous exposure to pesticides (Adams, 1995; Coble *et al*., 2005; Ritter and Arbuckle, 2007).

Results from the study revealed that the male gender used pesticides more when compared to the females. Previous research in Nigeria by Zyoud *et al.* (2010) and Pasiani *et al.* (2012) have backed up the result acquired from the study. This variable corresponds to the fact that men are at a greater risk of pesticide exposure since they come in contact more through its usage. It however contradicts studies done in other countries (Azaroff and Neas, 1999; Garcia, 2003) which further showed that females experienced a significantly increased pesticides risk. Previous studies by Hashemi *et al.* (2012) records that although farmers are mostly exposed to the adverse effects of pesticides as a result of their profession, every other creature too at one time or the other also falls victim. While WHO (1990) is of the opinion that although pesticides poisonings are major threats in the developing countries, Environews Forum (1999) asserts that worldwide pesticides poisonings could amount to about one million per year deaths and chronic diseases.

Age is an important factor among the socio economic characteristics that determines the level of awareness of the farmers about the approved and banned chemicals. Wilson and Tisdell(2001) and Fan *et al.* (2015) asserts that aged farmers might not be aware of the use of new chemicals due to lack of information or their inability to read government directive and most of them are more familiar and prefer the archaic method of controlling pest, some of which are outdated, banned and no more in use again. The researches further opined the inability of old farmers to take risk and hence their unwillingness to adopt new techniques and ideas. Experience at times correlate with age and probably would necessitate significantly the use of more pesticides (Idris *et al.*, 2013; Rahman 2016; Rahman and Chima, 2018). On the contrary, experience or age did not reflect on farmers pesticide use according to Adeniyi *et al.* (2017) and Anang and Amikuzuno, (2015).

The marital status is an important factor that determines the per capita income of the farmer. When a farmer has so many wives, there is this believe that there will also be many children, this tends to reduce the farmers per capita income because more number of people will depend on him for survival hence reducing his real income (Tijjani *et al.* 2018). On the other hand, the family member could serve as source of

labour for the farmer on his farm due to the polygamous nature practiced in the country. With a large family, application of pesticide on the farm will be easier and lesser number of hired labour will be used if the children are youth thereby providing adequate financial resources for the purchase of other basic needs and services. Moreover, the assertions of Mancini *et al*. (2005) that more harm is done than good to the immediate populace when division of labour is practiced within the same sphere of pesticides application cannot be overruled where family labour contributes a lot to farming activities (Tijjani *et al*. 2018).

Farmers' awareness about pesticides is expected to correlate with the educational status. Previous scientists (Ashburner and Friedrich, 2001; Hayes, 1982) informed that education has great influence on the overall behaviour and dispositions of individuals towards adoptions of agricultural related innovation. This on the other hand means that as the farmer's level of education increase, so also should pesticide effect on production be positive. Educated farmers can read publications and access information on the internet while the uneducated ones cannot do this, thus limiting their level of awareness to lack of information in terms of specific pesticide to use, right measurement, mixture, correct application of the pesticides and disposal methods. In the views of (Tijani, 2006), low level of education has impacted negatively on public health and on the general well-being of farm workers and other pesticide handlers such that it has become a matter of national concern in Nigeria following revelations about high levels of persistent pesticide (Osibanjo, 2002).

The size of the household has a significant effect on the resources available to the farmer in terms of labour and cost. Since one of the major aim of pesticide application is increased output, families with large household size would not mind using them to meet their desired satisfaction and throwing to the wind their demerits in terms of health and environment (Osibanjo, 2001; Konya, 2005; Adeniran *et al*., 2006). Household with mainly children, will constitute an economic burden on the farmer and so also large household size, although with larger farm size, there are chances of embracing new innovations due to individual exposure to happenings in the sphere of life (Tijjani *et al*. 2018). This reduces the available income to the farmers because of the number of people that depends on the farmer for survival, thus posing difficult for farmers to incur more cost on pesticides. Subsistence farmers are more prone to pesticide hazards due to self-involvement with the pesticides unlike large-scale farmers who usually get this job done by hired labour (Mabe *et al*. 2017). This assumption support the earlier report by WHO (1996), which, reported that the largest part of pesticide 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.

Researchers have emphasized that income will indirectly affect the purchase, type and use of pesticides (Williamson *et al*., 2008; Oluwole and Cheke 2009). Farmers in developing countries according to Wilson and Tisdell (2001) will always use pesticides more regardless of its hazards because of ignorance, no pesticides substitutes, underrating the cost of pesticide use over time, poor legislation and implementation. The reports of Oluwole and Cheke (2009) opines that Nigerian farmers with low income

use more pesticides when compared to their rich counterparts.

Conclusion

There was high awareness on pesticide usage with their usage for insect control ranking highest. The resultant use of pesticides for control of unwanted species has led to adverse implication on non-target organisms. Knowledge on pesticide usage though limited is necessary for environmental health management. Policy enactment, regulation, monitoring and updated data bank on pesticides, and its wholesome use by all stakeholders will stem down the hazards.

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