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Effects of Agro-Chemicals Usage by Farmers in Madagali Local Government Area of Adamawa State, Nigeria

[1]Omar Abdullahi Wafudu Handy, [2]Amina Ibrahim Omar, [3]Baba A. I. and [4]Yakubu Sule

[1,3,4]Department of Science Lab. Tech., Federal Polytechnic Mubi – Adamawa State –Nigeria. [2]Department of Horticultural Technology, Federal Polytechnic Mubi – Adamawa State –Nigeria.

Corresponding author: abdalwafud@gmail.com

Abstract

Agrochemicals are used by farmers in Madagali Local Government Area of Adamawa State - Nigeria to increase crop yields and food production. Most of the farmers are often literate and can follow precautions for their usage and application, decreasing the risk of exposures to humans and the environment. However, great fear has been expressed over the effects of agricultural chemicals on farmers' crops but little has been said about the effects such chemicals may have health effect on farmers who use the chemicals. Such issues may serve as points of focus around which workers involved in the use of these chemicals could be organized. While working with agrochemicals will always have dangers associated with it, a dual strategy at the point where these chemicals are used can help minimize these dangers. Moreover, one needs to ensure that farmers take direct responsibility in ensuring that suitable standards of safety are observed. The study has provided new innovative ways to widen the knowledge of farmers on the use and handling of agro-chemicals. The present study examined farmers' perceptions of the health effects of the use of agrochemicals in Madagali LGA. It has been revealed that agrochemicals were used by 85% of the farmers in the study area to maximize productivity. In addition, 65% and 83% of farmers used inorganic fertilizers and pesticides, respectively, to enhance production. Most of the farmers 76% had high levels of education and were able to read instructions for agrochemical use, therefore increasing the likelihood of agrochemical misuse and exposure to farmers. In total, 86.7% of farmers were exposed to the harmful effects of agrochemicals during their application. Finally, approximately 30% of farmers studied reported haven fallen sick after exposure to agrochemicals. This shows most farmers in Madagali local governments of Adamawa State –Nigeria are conversant with agro-chemicals.

Keywords: Agro-chemicals, Farmers, Evaluation, Health effect, crop yields, food production

Introduction

The basic need of human beings is food. Chemicals are added to promote the ripening of fruits or the germination of seeds. Food packaging has advanced due to the material produced by advancements in chemistry. Agricultural production in the rural areas is labour intensive. Often farm activities are not mechanized. Labour is made available on the farm in form of family labour, hired labour, community assistance, etc. (Ndaghu et al., 2018). They could be a possibility that the farmer might have adopted an innovation but due to

influence of alcohol he may continue or discontinue the use of such a technology (Jilayu et al., 2014). Agrochemicals are used by farmers in Madagali Local Government Area of Adamawa State to increase crop yields and food production. However, farmers are often illiterate and do not follow precautions for their usage and application, increasing the risk of exposures to humans and the environment. Chemical materials developed to assist in the production of food, feed, and fiber include scores of herbicides, insecticides, fungicides, and other pesticides, plant growth regulators, fertilizers, and animal feed supplements. Chief among these groups from the commercial point of view are manufactured fertilizers. Therefore, farmers tend to apply soil amendments that synthetic or organic amendments which are rich in nutrient, i.e., N, P, and K to enhance soil fertility and increase crop productivity. (Keteku et al., 2019). However, most growers apply fertilizers based on the general recommendations for each crop without prior knowledge of the soil fertility status and nutrient mineralization and release pattern from the fertilizers (Adebayo and James 2014), synthetic pesticides (Pesticide Stewardship Briefing Document, 2017). Hormone herbicides are just one of a variety of chemicals, including pesticides, insecticides, fungicides, and growth regulators, which are used in agriculture. The term agrochemicals are the best collective term to use when referring to these agricultural Chemicals. However, the word "pesticides" is often used when it is in fact all agrochemicals that are being referred to (Africa et al., 1992). Agrochemicals are chemicals such as pesticides and fertilizers, used to boost agricultural production. They are used as soil conditioners, acidifiers, and nutrients are also used to control diseases caused by bacteria, fungi, pests and viruses, enhancing agricultural productivity and safety. Factors such as balanced use, optimum dosing, correct application methods and timing help ensure increased agricultural productivity. Use of agrochemicals has led to increased food production. However, exposures to other organisms during their application, including humans, are poorly controlled. Their uses have significantly increased the concentration of toxic materials in food and the environment, with negative effects on plant and animal health. The World Health Organization (WHO) has estimated that more than three million farmers in developing countries are poisoned by agrochemicals each year.

Many pesticides contain hazardous and toxic materials. These materials pose public health and environmental risks when improperly disposed, including to surface water and groundwater. In addition, considerable quantities of out-of-date and banned pesticides are stored in homes and businesses, or are being stockpiled on farms, representing a significant risk to the environment and public health. (*Pesticide Stewardship Briefing Document*, 2017). Pesticides are some of the more toxic products used and stored in our homes and businesses, and on farms. According to American Association of Poison Control Centers, approximately 84,000 cases of human exposure to pesticides occurred in 2015 (*Pesticide Stewardship Briefing Document*, 2017) These pesticides are used in almost every facet of our everyday lives; ensuring the quantity and quality of food we eat to managing the number of rodents and insects in our homes. Although the usefulness of pesticides cannot be

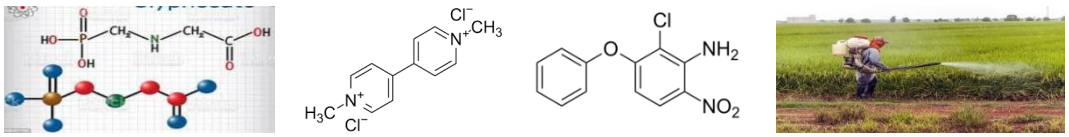
denied, the negative environmental and human health effects cannot be ignored. (Quinn *et al.*, 2011)

Those who suffer the negative effects of agrochemicals include farm workers, as well as workers in other sectors where these chemicals are used such as forestry and municipal workers, those involved in the production and distribution of chemical products, the farmers themselves, rural communities, urban household pesticide users, the consumers of chemical contaminated products and the broad community who stand to suffer in the long term as a result of damage to the environment (Quinn et al., 2011).

Presently, many agrochemical users in Madagali are not properly conversant of the risks and precautions involved in the use of toxic chemicals. Insufficient studies have been conducted on agrochemical application in Madagali. This study showed evidence of a relationship between farmers' exposure to agrochemicals and illiteracy. Due to the toxic hazardous nature of agrochemicals, it is crucial that actions be taken to make sure the safety of farmers. So far, no study has been carried out to examine farmers' perception of the health effects of the use of agrochemical in Madagali. Therefore, the aim of the present study was to determine the extent of the use of agrochemicals by farmers, category or type use, ability to read instructions, exposure to agrochemicals during application and perception of the health effects of exposure to agrochemicals in Madagali. This will be useful in the monitoring of agrochemical application and serve as a policy instrument for improved farming and ensuring the health of farmers in Madagali Local Government Area of Adamawa State.

Some agrochemical commonly used by farmers in Madagali local government area.

Broad Spectrum Herbicide is a non-selective, weed control for grasses and broadleaf weeds. It is formulated to deliver maximum performance and provide fast-acting results on a long list of weeds and grasses, as well as most mosses and lichens. Glyphosate- known by many trade names, including Roundup—has been the most widely used herbicide in the United States since 2001. Crop producers can spray entire fields planted with genetically engineered, glyphosate-tolerant seed varieties, killing the weeds but not the crops (Handy *et al.*, 2022).



Roundup Paraquat Gramoxone Aclonifen herbicide

Figure 1.1 Herbicides used in Madagali LGA of Adamawa State –Nigeria (Handy *et al.*, 2022)

Effectiveness of roundup herbicidal was discovered by Monsanto chemist (John E. Franz 1970, Monsanto 1974) brought it to market for agricultural use in 1974 under the trade name Roundup.

Pesticides and Insecticides

In order to minimize the damage of the crops by pests, a large variety of chemicals known as pesticides are used. Subclasses of this are herbicides, insecticides, fungicides, rodenticides, and biocides depending on its target. With active research in this field safer and greener pesticides are being developed (Atwood & Paisley-Jones, 2017) Insecticides are chemicals that are used to kill insects because they can spread livestock diseases, can eat stored grain, and can feed on growing crops. However not all insects are harmful, and certain species of insects are needed to pollinate plants to ensure that they set seeds. These agrochemicals prevent crop losses to insects and other pests. One study found that not using pesticides reduced crop yields by about 10%.(Africa *et al.*, 1992.)

Pesticides and other foreign substances in food products and drinking water along with toxic pollutants in the air pose an immediate threat to human health, whereas other contaminants gradually build up in the environment and in the human body, causing disease long after first exposure. It is also well known that many pesticides can accumulate in living species causing long-term and chronic effects, but there are difficulties in defining chronic exposure and disease outcomes, given the existence of a large series of variables of interest, such as lifestyle, occupation, diet preferences, and smoking, all of which must be taken into account to establish a disease-exposure relationship in the epidemiological investigation. Chemicals play an important role in the efforts of countries to achieve economic growth and fulfill their development objectives but, as much as they are vital for ensuring food security and economic growth, incorrect and indiscriminate use can be disastrous both for human health and the environment. In this context, agrochemicals can have a dual nature; they can be either beneficial or harmful, depending on numerous factors, such as the amounts to which exposure occurs (Damalas & Koutroubas, 2016)

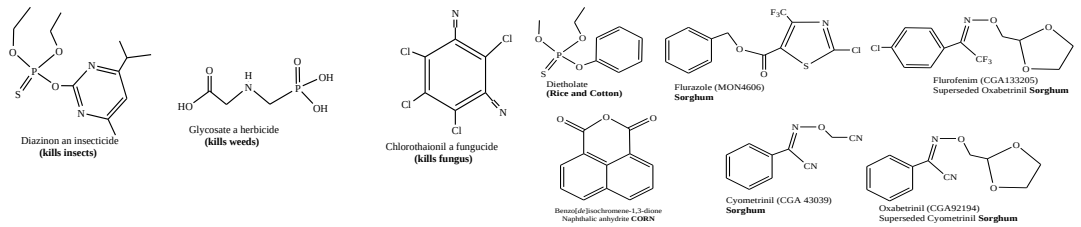


Figure 1.2 Structure of some agro-chemicals (Nicolopoulou-Stamati et al., 2016)

Figure 1.3 Farmer using agro-chemicals Worldwide (Handy *et al.*, 2022)

Figure 1.4 Traditional farming in Madagali LGA (Handy *et al.*, 2022, *Gryseels et al.*, 1984)

Figure 1.5 Rodents (rat) and insects (grasshopper) (Sword, 2011**,** Handy *et al.*, 2022)

Objectives of the study

The objective of the study was to assess the degradation of soil in Madagali Local Government Area of Adamawa State. The specific objectives were to:

- determine the extent of the use of agrochemicals by farmers, category or type used,
- ability to read instructions, exposure to agrochemicals during application and
- the perception of the health effects of exposure to agrochemicals by farmers in Madagali

Statement of the problem

Generally, in Nigeria, the greatest problem facing human existence has been deforestation and environmental degradation. As a result of deforestation, trees have undergone substantial deterioration, particularly in the northern part of Nigeria. Limiting this study to Madagali LGA, the vegetation is a characteristic of habitat that has been altered due to human interference with its previous natural climate formulation (Jilayu *et al.,* 2014). The cultivation, grazing activity, cutting of trees for fire wood and other purposes have a demonstrable effect on the livelihoods of the farming communities. Alex (2007), reported the use of agrochemicals as dangerous and toxic to health both humans and environment. Many small-scale farmers in the area cannot afford buying due to their expensiveness. (G.Y, 2013). In many countries the use of agrochemicals is highly regulated as government issues permits for the purchase and use of approved agrochemicals. Handling procedure on-farm, proper storage facilities and labeling, emergency clean up equipment, application and disposal are often neglected (Jilayu *et al.,* 2014) These agro-chemicals to some extent proved harmful not only for humans but also pose a great danger to the environment. The continuous usage of these chemicals for about 15 years was reported to turned cultivated land into barren land (Jilayu *et al.,* 2014). However, the use of these agro-chemicals accounts for increased crop yield, on the other hand the products are of less natural content and contain some heavy chemicals. (Ndaghu and Michael 2018)**,** reported that the use of synthetic fertilizers and chemical pesticides in the developing countries has grown

substantially during the past four decades. Government promoted the use of agro-chemicals in other to achieve national food security and improve the production of export crops.

Methodology

This Study was carried out in Madagali Local Government Area (LGA) of Adamawa State. Madagali LGA is located in the Northern part of the State. Geographically, it is located between longitude 13° 15¹ East of Green Meridian and Latitude 10° 30¹ Northern of the Equator. It is bordered by Borno State to the North, Cameroun Republic to the East, Michika Local Government to the South and Askira/Uba Local Government area to West. Majority of the population are farmers who produce varieties of agricultural products. Prominent among them are; Sorghum, Maize, Groundnuts, Cowpea, Rice, Sugarcane, sweet potato and vegetables as well as tree crops of various species and types (Giwa, 2006). Live-stocks are also reared in the study area which includes Cattle, Sheep, Goat, Rabbits, Poultry, and Pigs etc. The area has an estimated population of 134,827 people. National Population Commission (NPC 2006). National Population Commission (NPC); Provisional census figure Abuja, Nigeria. The people of Madagali are predominantly, Margi, Sukur, Waga, Matakam/Gra and Higgi tribes as well as, Hausa and Fulani people among others tribes from neighbouring settlements .The Margi, Sukur, Waga, Matakam/Gra and Higgi people are mostly farmers, while the Fulanis are cattle rearers. (Joshua *et al.*, 2018). The Local government is vegetative made up of grasses and some stunted trees in some parts of the area. The rainfall lasts for about 4-5 months in a year with an average rainfall of 700-1000 mm per annum (Adamawa State Ministry of Land and Survey (ASMLS 1999). The dry season begins in November and terminates in early June of the following year. Farming is the principal economy of the people in the area.

Sampling Procedure and Sampling Size

One hundred farmers were selected and interviewed using randomization sampling techniques in five wards of the study area (G.Y, 2013). These five wards include; Shuwa-Duhu-Mayowadu, Kirchinga, Gulak, sukur, and Madagali wards. These selected wards were based on their comparative application of agro-chemicals. The one hundred farmers were randomly selected from each ward, due to their constant use of agro-chemicals on their farms. Total of five hundred farmers formed the sample size. Data were collection at the end of questionnaires were correctly filled and returned without any rejection due to consistencies in their reactions. However, only three hundred and twenty farmers used agro-chemicals, fertilizer, one hundred and five used organic fertilizer while, seventy did not use organic manure nor agrochemical fertilizer as presented in table 1.1. Also, three hundred farmers were selected to know the level of agro-chemicals used, their ability to read instructions of agro-chemicals, exposure to agro-chemicals, and farmers perception of health effects exposure to agrochemicals presented in table 1.2

Table 1.1 Evaluation of 5 wards of 100 farmers each using fertilizers in Madagali LGA.

Wards/No. of farmers	Organic manure	Org. manure and synthetic inorganic fertilizer	No fertilizer
Shuwa-Duhu-Mayowadu	15	75	10
Kirchinga	25	55	20
Gulak	20	65	15
Sukur	25	60	15
Madagali	20	70	10
Total /Average farmers	105/5 = 21%	325/5 = 65%	70/5 = 14%

Table 1.2. Three hundred farmers and level of agrochemicals used in Madagali LGA

Variable	Frequency	Percentage
Use agrochemicals	250	83.3
Do not use agrochemicals	50	16.7
Use pesticides	265	88.3
Did not use pesticides	35	11.7
Ability to read agrochemical instructions		
Able to read instructions	204	68.0
Unable to read instructions	96	32.0
Farmers exposed to agrochemicals during application		
Not exposed	40	13.3
Exposed	260	86.7
Farmers perception of health effects exposure to agrochemicals		
Sick	90	30.0
Not sick	160	53.3
Indifference	50	16.7
Literate 250 + 265 + 204 + 260 + 160 = 1140/5 = 228	228	76.0%
Illiterate 50 + 35 + 96 +40 + 90 = 311/5 = 72	72	34.0%

Farmers exposed to agrochemicals during application (Damalas & Koutroubas, 2016)

Results and discussions

The present study reveals that majority of farmers in the Madagali local government area, (65%) used organic manure and Inorganic fertilizers (nitrogen, phosphorus, and potassium (NPK)) and 21% used organic fertilizers compost manure. Not used either Fertilizer organic and Inorganic, or organic fertilizers (compost manure) 14%. From findings during the study more than average of the farmers used agrochemicals 83.3% and 16.7% did not use agrochemicals, however, 265 of the farmers 88.3% used pesticides, while 11.7 did not use pesticides. (68%) of the farmers were reported that they were able to read agrochemical

application instructions, while 34.0% of farmers were unable to read agrochemical application instructions. Out of 300 farmers 260 (86.7%) were reported exposed to agrochemicals during application and 40 (13.3%) not exposed to agrochemicals during application, and most farmers (73%), reported falling sick after exposure to agrochemicals. Farmers perception of health effects exposure to agrochemicals were 53,3% not sick, 30% fallen sick, while, 16.7% indifference could not fall sick or have fallen sick.

From the table 1.2 76.0% of the total farmers are literate, approximately 20.7% are illiterate while 3.3% indifference. Use of agrochemicals has led to increased food production. However, exposures to other organisms during their application, including humans, are poorly controlled. Their use has significantly increased the concentration of toxic materials in food and the environment.

Conclusion

This study which has been successfully carried out revealed the effect and remedy using agro-chemicals by farmers in Madagali local government area of Adamawa State, The study have provided new innovative ways to widen the knowledge of farmers on the use and handling of agro-chemicals. The present study examined farmers' perceptions of the health effects of the use of agrochemicals in Madagali LGA. This study revealed that agrochemicals were used by 85% of the farmers in the study area to maximize productivity. In addition, 65% and 83% of farmers used inorganic fertilizers and pesticides, respectively, to enhance production (Cerda, 2021). Most of the farmers (76%) had high levels of education and were able to read instructions for agrochemical use, therefore increasing the likelihood of agrochemical misuse and exposure to farmers. Seventy (34%) farmers in this study, reported that they could not read agrochemical application instructions In total, 86.7% of farmers were exposed to the harmful effects of agrochemicals during their application, and 90 farmers (30%) reported falling sick after exposure to agrochemicals (Damalas & Koutroubas, 2016). This shows most farmers in Madagali local governments of Adamawa State –Nigeria are conversant with agro-chemicals

Recommendation

We recommend that agricultural extension agents provide farmers with comprehensive training in agrochemical use to ensure their health and lower environmental risks

Government should enable early distribution of fertilizers and chemicals at subsidized rate so as to enable peasant farmer and youths engage in farming;

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