

ISSN: 2415-038X (Print)

OPEN LETTER

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## Mismanagement of pesticides among smallholder farmers: A growing concern

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### Abstract

**To cite:** Kweleka M, Musa J, Bwalya B., Mismanagement of pesticides among smallholder farmers: A growing concern. JPRM 2023, 5(2): 6-9. doi: <https://doi.org/10.21617/jprm20232.522>

Africa's agricultural sector faces a significant threat from pests and diseases, leading to increased reliance on chemical pesticides among smallholder farmers. Recent surveys across Sub Saharan Africa reveal high pesticide use, with up to 87% reported in Rwanda. However, the indiscriminate use and improper disposal of pesticides raise concerns about long-term effects on human health and the environment. Epidemiological and molecular research underscores the risks of pesticide exposure, contributing to respiratory complications, reproductive disorders, birth defects, and environmental disruptions. Smallholder farmers, frequently exposed without proper protection, suffer from various health symptoms, such as headaches, skin irritations, and digestive issues. Globally, pesticide poisoning accounts for nearly 300,000 deaths annually. Efforts to address this issue require a multi-pronged approach. Firstly, investment in agricultural extension services is essential to provide training on sustainable farming practices that reduce pesticide dependence. Secondly, policymakers must promote safer alternatives to highly hazardous pesticides, including bio-pesticides, botanical extracts, and integrated pest management techniques. Finally, strengthening regulatory frameworks and enforcement is crucial to control pesticide sale, distribution, and ensure safe usage. The misuse of chemical pesticides poses a serious threat to human health, the environment, and agriculture productivity. Addressing these challenges requires immediate action to ensure the well-being of smallholder farmers, protect human health, and safeguard the environment.

**Keywords:** *Agriculture, Smallholder farmers, pesticides, Aluminium phosphate*

## INTRODUCTION

To the Editor,

Africa's agricultural sector faces a serious threat from pests and diseases [1]. As a result, its farmers are increasingly dependent on chemical pesticide usage for pest management in their crop and livestock production. Recent surveys of smallholder maize growing households in Sub Saharan Africa suggest high pesticide use, ranging from nearly 50% in Ethiopia, 60% in Kenya, 60% in Zambia [1] to 87% in Rwanda [2]. While chemical pesticides provide short-term relief, their long-term effects are deeply concerning. Human beings are subjected to direct and daily exposure to pesticides during their production, treatment and storage, and indirectly, but with no less serious consequences for being exposed to pesticide residues found in the environment and in products consumed [3]. Epidemiological and molecular research has highlighted that exposure to pesticides by humans increased risk respiratory complications, reproductive disorders and birth defects. Additionally, the environment is affected as vital ecosystems become disrupted [4, 5].

The increased use of pesticides entails that such exposure to them by humans has increased too. In response, authorities attempt to stem exposure to pesticides by formulating regulations on their manufacture, handling, transportation, use and disposal. For instance, the Environmental Management Regulations

(Statutory Instrument No. 112 of 2013) prescribe the use of personal protective equipment by persons handling or using a pesticide; the disposal of expired or left over pesticides through recycling or high temperature incineration and ban the handling of pesticides by children and pregnant women [6].

However, despite these regulations, incorrect use and disposal of pesticides continues seemingly unabated.

During our recent fieldwork in Central and Eastern Zambia, discussions with smallholder farmers and agro dealers revealed easy access to highly hazardous pesticides by smallholder farmers with little knowledge on their safe use and disposal. Anecdotal evidence suggests that incorrect application of chemical pesticides had resulted in serious illnesses among farming households and environmental pollution. For instance, the highly hazardous pesticide, Aluminium phosphide (see Figure 1) is routinely incorrectly applied on maize, resulting in occasional but increasing incidences of hospitalizations after consumption of maize to which the pesticide was applied. Our interviews with agro dealers revealed that many of them have incorrect knowledge on the application of this highly hazardous fumigant and on disposal of empty containers of pesticides.



**Figure 1.** Aluminium phosphide on sale in an agro shop, Chipata Zambia.

According to a survey on chemical pesticide use among smallholders conducted by Malambo and others [7] in five districts of Zambia, a total of 162 chemical pesticide trade

names, consisting 52 active ingredients were used by farmers. Rwomushana and others [8] reported that a third of farmers (33.9%) in the country made between six to ten pesticides

applications per season, while about 29% made one to five applications per season [7]. Such frequent applications are associated with indiscriminate use of chemical pesticides, misapplication of pesticides, improper disposal of containers, and poor attitudes of farmers towards dangers of pesticides on human health and the environment [2, 9].

Furthermore, inappropriate use of pesticides produces a vicious circle: increasingly toxic formulations are required due to demand for more intense doses induced by pesticide resistance. The inappropriate use of pesticides poses significant risks to human health. Smallholder farmers, who are frequently exposed to these chemicals, usually without adequate protective measures, face numerous health hazards. In Zambia, headaches, skin itching, dizziness, eye irritations, sneezing, difficulty in breathing, diarrhea and stomach aches are some of the most common health symptoms reported by farmers as a result of mishandling of pesticides [2, 7, 8]. Poisoning from pesticides is a global public health problem and accounts for nearly 300,000 deaths worldwide every year [7]. Such statistics are alarming and buttress the need for solutions to address the adverse effects of pesticides.

To address these challenges, a multi-pronged approach is required. First, there is a need for increased investment in agricultural extension services to provide smallholder farmers with training and guidance on sustainable farming practices as these are premised on nutrient cycling and natural pest control processes. These natural processes reduce the need for amendments of chemical pesticides. Second, policymakers should prioritize the development and promotion of safer alternatives to highly hazardous pesticides. This may include supporting research and innovation in bio pesticides, botanical extracts, and other environmentally friendly pest management approaches as well as providing economic incentives towards the use of such products. We echo the calls for shifts to integrated pest management (IPM) and reduced reliance on chemical pesticides by encouraging the use of a combination of sustainable pest control practices. IPM techniques include judicious use of pesticides, as well as non-chemical pest management practices, such as intensive monitoring, use of pest resistant varieties, physical, mechanical and biological control [2, 10, 11]. The use of bio-pesticides,

sourced from natural entities such as fungi, bacteria, algae, viruses, nematodes and protozoa and botanicals (e. g. Neem, Pyrethrum, Ryania, Sabadilla and Eucalyptus oil), offer nontoxic pest control options [12]. Third, it is crucial to enhance regulatory frameworks to ensure the responsible use of pesticides. Stricter regulations should be enforced to control the sale and distribution of highly hazardous pesticides, requiring farmers to undergo training and obtain permits for their use. Monitoring programmes should be established to assess pesticide residues in crops and enforce safe residue limits to protect consumers' health.

In conclusion, the misuse of chemical pesticides among smallholder farmers demands immediate action from all stakeholders involved in the agricultural sector. If nothing is done, human and environmental health will continue to be adversely affected as pesticide residues build up in soils, food and the environment. This will consequently further burden state budgets as governments attempt to mitigate these outcomes. Further, previous and current efforts to enhance smallholder agriculture productivity will be thwarted as soil health further declines due to pesticide pollution. By providing training on correct use of pesticides, promoting sustainable farming practices, and ensuring stringent regulations, we can work towards a future where smallholder farmers thrive, human health is protected, and our environment is protected.

## DECLARATION

**Competing interests** There were no competing interests from all authors in this study.

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