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# **Agro-Chemical Use in Crops in Ghana: Multidimensional Impacts and Sustainable Solutions**

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## **ABSTRACT**

Agrochemical usage in Ghana's agriculture sector has become indispensable for enhancing crop yields and combating weed infestations. However, its extensive application raises concerns due to its adverse effects on soil fertility, human health, and biodiversity. This study examines the multifaceted impacts of agrochemicals in Ghana, emphasizing the need for sustainable agricultural practices to mitigate these challenges. Through an analysis of the effects on crop yield, soil fertility degradation, human health risks, and biodiversity loss, this research underscores the urgency of regulatory measures and the adoption of organic farming methods. The findings highlight the importance of balancing agricultural productivity with environmental and human health considerations to ensure long-term sustainability.

**Keywords:** Agrochemicals, Crop Yield, Soil Fertility, Human Health, Biodiversity, Ghana, Sustainable Agriculture, Organic Farming

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## **INTRODUCTION**

Agriculture serves as the cornerstone of Ghana's economy, contributing significantly to its gross domestic product (GDP) and providing livelihoods for a large portion of the population [1]. With over 57% of the country's territory deemed suitable for agricultural activities, Ghana possesses immense agricultural potential [2]. However, this potential is hindered by various challenges, chief among them being the degradation of soil fertility, which compromises agricultural productivity [3]. In the pursuit of increased crop yields and agricultural output, Ghana, like many other developing nations, has embraced the use of agrochemicals [4]. These chemical inputs, including fertilizers, pesticides, and herbicides, have become integral components of modern agricultural practices, aiming to combat pests, weeds, and soil nutrient deficiencies [5]. While agrochemicals have undoubtedly contributed to boosting crop yields and meeting the demands of a growing population, their indiscriminate and excessive use has raised concerns regarding their long-term sustainability and the unintended consequences they bring [6]. The use of agrochemicals in Ghana is influenced by a multitude of factors, including population growth, urbanization, economic pressures, and environmental degradation. Rapid population growth exerts pressure on agricultural land, leading to the intensification of farming practices and increased reliance on agrochemical inputs to maximize yields. Additionally, urbanization and economic development have driven changes in dietary preferences and consumption patterns, further incentivizing farmers to adopt intensive farming methods to meet market demands [7]. Despite the short-term benefits of agrochemical usage, there is growing recognition of its adverse impacts on soil fertility, human health, and environmental sustainability. Soil degradation, resulting from the overuse of chemical fertilizers and pesticides, poses a significant threat to the long-term viability of agricultural systems [8]. Soil erosion, nutrient depletion, and loss of biodiversity are among the consequences of unsustainable agrochemical practices, undermining the resilience of ecosystems and agricultural productivity. Moreover, the indiscriminate application of agrochemicals raises serious concerns regarding human health and safety [9]. Farmers and agricultural workers are exposed to hazardous chemicals during handling and application, leading to acute and chronic health issues. Furthermore, agrochemical residues can contaminate water sources, food products, and the environment, posing risks to consumers and ecosystems alike. In light of these challenges, there is an urgent need to reevaluate current agricultural practices and transition towards more sustainable and environmentally-friendly alternatives [10]. Organic farming, integrated pest management, and agro-ecological approaches offer promising pathways towards reducing reliance on agrochemical inputs while promoting soil health, biodiversity, and human well-being. This study seeks to examine the multidimensional impacts of

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agrochemical use in Ghana's agriculture sector, focusing on its effects on crop yield, soil fertility, human health, and biodiversity. Through a comprehensive analysis of existing literature and empirical evidence, this research aims to elucidate the complexities surrounding agrochemical usage and propose evidence-based strategies for promoting sustainable agriculture in Ghana. By fostering dialogue and awareness on the importance of sustainable farming practices, this study endeavors to contribute to the development of resilient and equitable food systems that ensure the well-being of both people and the planet.

#### METHODS

This study employs a comprehensive literature review approach to assess the impacts of agrochemical use in Ghana. It synthesizes existing research and empirical evidence to analyze the effects on crop yield, soil fertility, human health, and biodiversity. Data from scholarly articles, reports, and governmental publications are systematically reviewed to provide insights into the multifaceted implications of agrochemicals in Ghanaian agriculture. Additionally, case studies and empirical studies from similar agricultural contexts are utilized to supplement the analysis and draw parallels.

#### Agro-Chemical Use in Crops in Ghana

Infrastructure, which is focused on key sectors such as agriculture, contributes around 41% of the gross domestic product (GDP) [2]. The agrarian sector of the country is endowed with over 57% of territory that is considered suitable for agricultural practice, which account to about 6,331,000 hectares of cropland being compromised by poor soil fertility. The report stresses the need for annual food production increase, which is coupled with increasing of crop protection chemicals' use, organic fertilizers, improving water and soils management, and expanding agricultural estate [3]. In spite of this, the method differs from the global trend where one land farmer pens each inch of land among urbanized due to population growth, erosion, soil fertility reduction, and desertification. The research reckons that the vast application of agrochemicals is the only viable way in big scale farming in order to overcome weed infestation and other issues.

#### Effects of Agrochemicals Crop Yield

Being beneficial for the crop blasting rate, usage of agrochemicals leads to adverse consequences with time. Fertilizer, understandably chemical compounds of nitrogen (N), phosphorus (P), and potassium (K), is most of the time used in Ghana for growing cocoa, oil palm, cola nut, coffee, and many vegetable and fruit plantations. The analysis of European agriculture with its yields of wheat which increased threefold within this period, starting from 1960 to 2000 due to fertilizers application [4]. Consequently, exhaustive application of fertilizers to uncontrolled levels can lead to the decline in soil fertility that is demonstrated by the decrease of maize and wheat yields between 50% and 32% since early repeated fertilization of potassium [5]. Moreover, the inefficacy of fertilizers where about half and three quarters of it are lost through leaching require space for producing more fertilizer which in turn result in elevated chemical levels in the field specified destination which promotes biodiversity loss.

#### Soil Fertility

In the long run, agrochemicals destroy soil productivity through acidification or alkalization of the soil; the latter leads to depletion of nutrients in it [6]. In case of fertilizers that are nitrogenous, for instance, they can cause the acidification of soils for the farmers in Ghana. Authors indicate a Soil pollution increase in China between 2000 and 2008 reached a peak due to agrochemical residue, especially DDT [7]. There is a suggestion that the agrochemical input could partially solve water and soil pollution problems in China's rural areas the results of which are elaborated by Huang et al., the researchers, who say that a decrease in the organochlorine pesticide use would lead to a lower concentration of the latter in the rural water and soil.

#### Human Health

People face a variety of diseases through the chemical exposure, including the carcinogenicity, chronic toxicity and the reproductive disorders [8]. Reside in the body, contaminate the water and be encountered in the air during the processes such as direct exposure through the air or in the water contribute to various problems of health, that is, cancer, anaemia, respiratory infections and multi-generational reproductive effects. The statistics about the intertwined consequences between death and severe impact gathered in developing countries clearly present the high number of deaths, around 10,000 people deaths, and 40,000 people's health severely impacted due to agrochemical pollution [9]. It is the farmers and their families who feel the brunt of the pesticide situation in these regions more than others and so, urgent action to control the application of agrochemicals is required so as to guard human health.

#### Biodiversity

Agrochemicals reduce the plant diversity in agro-ecosystems make them to mostly grow the same types of species and highly compete each other hence their availability for the plants coexisting in the same agro-ecosystem mean

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soil and light availability [7]. Farmers spray pesticides over the plants and crops, thus breaking the balance of the natural pest control system. As a result, insectivorous birds are negatively impacted because they not all types of insects become affected by it [9]. These physicality modifications could lead to eggshell thinning, to embryos' mortality, fertility decreases, wasting syndrome, to incubate and rear chicks' dysfunctions. Besides farming runoff, agrochemicals contribute to the water pollution, limiting possibilities of life forms to thrive especially around the water bodies and therefore interfering with biodiversity.

#### The Way Forward

Control measures are important for reducing the adversity that agrochemicals create. Among others are adhering to manufacturer instructions, storage that can be done in sites that don't have leakages, and individuals who handle agrochemicals should put on the protective gear [6]. Moreover, organic farming is promoted as a safer and more sustainable approach aside the traditional one. In the organically based farming assisting in the soil fertility maintenance and protection of environment are the organic fertilizers, crop rotation, companion planting, and biological pest control. It advises to have such standards, where the synthetic substances can be use of in the minimum level while the naturally occurring ones will be allowed [8].

The presented study provides us with the views regarding multidimensional effects of the use of agrochemicals in Ghana, which proves that there is necessity of maintainable and environmentally endured agricultural practices [5]. The study brings out the significance of legislative measures, provision of information to people at large and the use of organic farming to reduce or abolish the negative effects on all the three above factors. This research helps the dialogue already going on around international agriculture systems and promotes a shift in the practices to ones that, while making sure the long-term food security, at the same time, don't affect negatively the health of eco-systems and people [9].

#### CONCLUSION

The extensive use of agrochemicals in Ghana's agriculture sector poses significant challenges to crop productivity, soil health, human well-being, and biodiversity. While agrochemicals have played a vital role in increasing agricultural yields, their adverse impacts necessitate urgent action to promote sustainable practices. Regulatory measures, public awareness campaigns, and the adoption of organic farming methods are essential for mitigating the negative effects of agrochemicals and ensuring the long-term sustainability of Ghana's agricultural sector. This research underscores the importance of integrating environmental and human health considerations into agricultural policies and practices to foster resilient and equitable food systems.

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