

# **IRAD: THE USE OF PESTICIDES IN MAIZE CULTURE: HEALTH AND ENVIRONMENTAL IMPACTS ON HUMAN BEINGS**

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## **Abstract:**

Agriculture in Cameroon is, and remains, the predominant sector of the national economy, both in terms of its contribution to GDP and the training effects on other sectors of activities. Production systems are varied. The following are illustrative: extensive traditional systems, semi intensive traditional systems, enterprise production systems, modern operations. In each of the regions, production systems are characterized by the predominance of one or a few basic cultures, which are associated with secondary cultures. Despite particularly favorable natural conditions, multiples pesticides and agricultural inputs, human beings face serious health problems. In this study, we will analyze the impacts of agricultural inputs used in maize cultivation on human health.

**Keywords:** Cameroon, food security, agricultural input, impact, Man.

## **Introduction**

Cameroon, due to its geographical location, has a wide variety of soil and climates that allow the country to be divided into 5 major agro ecological zones. With a growth rate of around 3% Cameroon's population, estimated at 17.3 million in 2006, increased to more than 25 million in 2016. The Institute of Agronomic Research for Development (IRAD), which is a public administrative institution under the technical supervision of the Ministry of Scientific Research and Innovation, is full of operational research structures. These structures are the location and execution of the Institutes' scientific and technical activities. They represent decentralized and regionalized agricultural research units. Many sociological studies and research that address the impact of agricultural inputs on humans abound, but fail to address in depth the adverse medium and long term consequences of these fertilizers and pesticides on human health and the environment. This study, which focuses on the impact of agricultural inputs on humans, is part of the theme of sociology's development and social change. Thus, the following questions arise from this observation. How is the use of fertilizer necessary in agriculture? What health and environmental impacts are humans beings exposed to? Our reflection will focus on two major points: the state of food security in Cameroon and the impact of the use of fertilizers and pesticides on human beings.

## **I-MATERIALS AND METHODS**

### **1- Geographical location of Cameroon**

Located in Central Africa, Cameroon stretches from the Gulf of Guinea to Lake Chad, between 2° and 13° latitude North and 8°30' and 16°10' longitude East (Letouzey, 1985). The country has an area of

475,650 km<sup>2</sup> with a maritime façade of 402 km. Its triangular length is 1400km from North to South and its width from East to West is about 800km as most. It is limited to the South by Congo, Gabon, and the Atlantic Ocean, to the West by Nigeria, to the North by Lake Chad, to the East by Chad and the Central African Republic. This geographic location has many physical assets, including considerable hydroelectric potential, an impressive diversity of agricultural activities, and a subsoil that abounds in important mineral resources. It is also scattered with protected natural areas that still need to be developed and some of which, like the Dja reserve, are part of the heritage of mankind. Because of this privileged geographical location and its stretching in latitude, Cameroon has a great diversity of soil and climate conditions and a significant diversity of ecosystems that are home to an equally rich and diverse flora and fauna.

## **2- The study area: zone of the Western Highlands (zone III)**

The area is between 4° 54'' at 6° 36'' North latitude and 9° 18'' at 11° 24'' East longitude and covers western and northwest provinces and covers a total area of 3.1 million hectares. It offers a great diversity of reliefs: the Bamoun Plateau extends at an altitude of 1240m; the Bamileke plateau that goes up to Mount Bamboutos (2,740M) and toward the volcanic plateaus of Bamenda are located at 1,800m (IRAD, 1996).

The climate is of the "Camerounian altitude" type, marked by two seasons of uneven lengths: a dry season, more marked than in zone IV, from mid November to mid March, and a rainy season from mid March to mid November. Average temperatures are low (19°C), and heavy rains (1500-2000mm) fall according to a monomodal configuration. The landscapes, characteristic of medium mountains, have in some places savannah vegetation, sheltered plateaus, depressed basins and plains crossed by gallery forest. All kind of crops are grown here: coffee, tea, banana, maize peanut, rice, vegetable crops (MINEP, 2006). After introducing Cameroon and the Western High plateau area, the site and country of study area, we will discuss the state of Cameroon's food security and define the inputs and/or fertilizers that are used in maize cultivation.

## **II- State of food security in Cameroon**

The Rural Sector Development Strategy Paper and FAO statistics show that the current energy consumption in Cameroon is 2,300 Kcal. This consumption is lower than the average in developing countries of 2,600 Kcal/person/day. Food insecurity affects 25% of the population and presents disparities between regions and different population groups.

The southern, moderate risk areas, which cover the southern part of the country, include the Western High Plateaus are where the risk to food security stems from land pressure on overexploited and degraded soils. The food security of wetland forests is due to low productivity, poor crop conservation and the lack of essential protein and mineral salts. As regards food self-sufficiency, the availability of food fell sharply in the early 1980s. The food situation by type of product published in 1985 already showed a deficit in coverage of the needs of 36.8% in cereal, 53.2% in pulses, 51% in vegetable oils and 74.1% in meat. Since the late 1990s, the situation has improved considerably for pulses and vegetable oils with a coverage rate of about 100%. Concerns remain, however, for cereals, the basis of Cameroon's diet, which are widely imported to cover the needs of food and feed. As food production has not always kept pace with population growth, the coverage rate for cereal needs is currently only 70%, and explains the increase in cereal imports after the lull following the devaluation of the CFA Franc.

## **1- State of diversity and relative importance of major staple crops for food security**

Crops that have the greatest contribution to food and agriculture include cereals, tubers and amylaceous roots, vegetables crops, fruits and vegetables. Among the cereals grown in Cameroon, we will study maize, which is one of the most consumed foods in Cameroon.

- **Maize**

Research has allowed the development and popularization of many varieties adapted to the country's various agro ecological zones. This is the case for the different varieties that are recommended for low altitude areas: Ekona white, Ekona yellow, Ekona mixed color and Ekona synthetic. For areas where kwashiorkor is prevalent, the OPACO variety, rich in lysine and tryptophan due to the presence of the "opaque 2" gene, was created and popularized. In addition, 4 synthetic varieties tolerant to acidic soils have been created and incorporated into production system. In general, many varieties have been selected and popularized in various agro ecological zones according to their adaptation to local soil, climate and disease and pest resistance.

## **2-The natural causes of the decline in production**

The agro ecological zones of Cameroon, particularly the agro ecological zone III, are undergoing unpredictable changes in climatic conditions that inevitably affect phylogenetic resources and crop diversity. These are mainly droughts leading to reduced production, which jeopardize food security and cause the disappearance of species that have not been able to complete their breeding cycle during the very short rainy season imposed by climate change. In the southern part, the chromolaena odorat, a plant plague, colonizes all fallow and bare spaces. In the northern part, the Striga, colonizes maize, sorghum, and nibaceous, resulting in considerable loss of yield. Crop diseases, animals and insects such as locusts in the northern part of the country also posed a threat to biodiversity.

## **III - RESULTS**

### **1- The use of pesticides, agricultural inputs/fertilizers in maize cultivation**

In agriculture, inputs are referred to as the various products brought to the land and crops, which do not come from the farm or its proximity. The inputs are not naturally present in the soil; they are added to improved crop yields. The main inputs are:

- Fertilizing products, means fertilizes and amendments,
- Plants protection products, from the pesticide family: these are products used to eradicate crop pests,
- Growth activators or retarders,
- Seeds and plants.

More generally, input means any product necessary for the operation of an agricultural holding. This ranges from farm equipment to veterinary fees.

### **2- Agricultural fertilizer**

Fertilizers are organic or mineral substances, often used in mixtures, intended to provide plants with supplements of nutrients in order to improve their growth and increase crop yield and quality. The action of bringing fertilizer is called fertilization. Fertilizers are available in several forms, including: organic fertilizer, chemical fertilizers and organo-mineral fertilizers. Organic fertilizers come usually from animal or plant. They come from industrial waste, such as waste from slaughterhouses; plant waste, means green residues, composites or not, and they may also consist of plants grown specifically as green fertilizers, or prepared for that purpose. They are also by-products of livestock farming. Mineral fertilizers are substances of mineral origin, produced by the chemical industry, or by the exploitation of natural deposits of phosphate and potash. Organo-mineral fertilizers are the result of mixing mineral fertilizers and organic fertilizers. Fertilizer use has two types of consequences that may involve health risks. Our sample is made up of 100 families engaged in subsistence farming.

**Table 1: Distribution of sample by age**

Age	[25-35years old ]	[ 35-45years old]	[ 50 years old and +
Number	10	25	65

According to this table, 65% of our sample is over 50 years old. The majority of the sample are parents who practice farming during all crop years. They are later most exposed to pesticides and inputs. The 25-35 age group consists of young couples who are not working and are illiterate. The last age group 35-45 consists of young people who, having completed their studies and because of lack of employment, return to the village to practice farming.

**Table 2: Study of exposure to pesticides and fertilizers**

	Pesticides, chemical fertilizers	No pesticides, organic fertilizers
Diseases	Cold, stomach aches, eye disease, rare and often unexplained diseases by farmers	R.A.S (no disease observed)

### 3- Impact of fertilizer on human health

Many fertilizers are endocrine disruptors. Their toxicity is not limited to the only species that are intended to be eliminated. They are especially toxic to humans and their effects on the environment are numerous. Substances and/or molecules resulting from their degradation are likely to be found in air, soil, water, sediments, etc, as well as in food. They are present, through their migration between these environmental compartments, more or less significant dangers to humans and ecosystems, with a short or long term impact. Acute poisoning, linked to very high exposure over a short period of time, can use poisoning, skin or eye risks. Chronic intoxication due to lower exposure over a longer time can cause many diseases such as: asthma, cancer, diabetes, risk of infertility in human beings, malformations or even neurological disorders. ( Alzheimer's, Parkinson's, autism).

### 4-Impact on the environment agricultural

Inputs have a significant impact on biological diversity, habitat loss and climate change. In the short term, the consequences of fertilizer use are characterized primarily by direct or indirect poisoning of organisms, non fall effects on reproduction and behavior. The most cited environmental risk is drinking water pollution. This pollution occurs when fertilizers, spread in excess of plant needs and soil retention capacity, are dragged to the groundwater by infiltration, or to streams by runoff. A less cited, yet very important, environmental risk is the contribution to global warming, owing to the high emissions of nitrogen oxides after application, including nitrogen protoxide (N<sub>2</sub>O), a powerfull greenhouse gas, with high global warming potential, but with a moderate residence term (of the order of 100 years).

More generally, the consequences of fertilizer use, which can be risky and subject to criticism, are as follows:

- effects on soil quality, fertility, structure, humus and biological activity;
- effects on erosion;
- effects of eutrophication of freshwater and marine waters linked to the nitrogen cycle and

diffuse pollution caused by the toxicity of nitrates in drinking water or for certain species, and by their eutrophication and promoting turbidity of water;

- effects of degradation of unused fertilizers, which emit greenhouse gases, nitrogen oxides (N<sub>2</sub>O and N<sub>2</sub>O<sub>4</sub> nitrogen protoxyde), in the atmosphere;
  - effects of eutrophication of freshwater and marine waters linked to the phosphorus cycle (eutrophication or dystrophization);
  - effects of other nutrients: potassium, sulfur, magnesium, calcium, trace elements;
  - effects of heavy metals: cadmium, arsenic, fluorine, present in mineral fertilizers and pig slurry;
  - effects related to the presence of radioactive elements (significantly present in phosphates);
  - effects on crop pests;
  - effects on product quality;
  - pollution from the chemical fertilizer industry and certain organic fertilizers;
  - use of non-renewable energy for transport and application;
- . depletion of mineral resources
- indirect effects on the environment, including mechanization for intensive agriculture and spraying.

### **5-Impact of pesticides on the environment**

The term pesticide refers to substances used in the control of organisms considered undesirable by human plants. It is often used for agricultural purposes, but it also includes non-agricultural uses such as road maintenance, green spaces and private gardens. The presence of pesticides in water is subject to standards for their maximum concentration to be observed. On the other hand, there are none concerning their presence in the atmosphere. According to Atmo Nouvelle-Aquitaine, several pesticide molecules are detected in the air every year.

The presence of pesticides varies depending on the season. Pesticides are detected in the air throughout the year. However, seasonality, particularly in relation to periods of agricultural treatment, imparts its influence on the timing of measured concentrations. The temporal evolution of pesticides in air is not only related to their use period, but also to their persistence in the environment. For example, some compounds are measured in the air during treatment periods and during the following days or weeks: their presence is then linked to the volatilization of the molecules from the soil, the plant itself or the re suspension of the soil particles. Pesticides travel very far and some of them persist for a long time in the environment. Being present in different forms around us (outdoor and indoor air, groundwater, soil, food and drinking water), pesticides can also have an impact on human health, chronically exposing us throughout our lives. These mixtures of pesticides also give rise to unpredictable health impacts, which should make them one of the major issues research and hazard assessment.

However, a growing number of studies link pesticide exposure to certain diseases in human beings and warrant a preventive approach to reducing our pesticide exposure. Based on several scientific studies published between 2003 and 2012, the Canadian Cancer Society listed a few tips that help consumers reduce their exposure to pesticides. When applied, some pesticides are absorbed by the skin, swallowed or breathed. Children remain the most susceptible to this contamination, as their immune systems do not allow them to defend themselves as effectively as adults. Studies suggest that exposure to neurotoxic compounds in certain pesticides is linked to various types of cancer, including childhood brain cancer.

Several experimental or epidemiological studies suggest a greater risk of cancer following chronic exposure to certain commonly used pesticides. International agencies responsible for assessing carcinogenic potential, such as the International Cancer Research Center (IARC) and the United States Environmental Protection Agency (U.S. EPA), have classified many pesticides as likely carcinogenic to humans. The most commonly cited types of cancer are brain cancer, soft tissue sarcomas, non-Hodgkin lymphoma, Hodgkin's disease, and leukemia.

Studies of laboratory animals according to the U.S. EPA indicated that some pesticides could be responsible for effects on reproduction and fetal development. Some reproductive effects, including spontaneous abortion, prematurity, decreased fertility, decreased sperm production and mobility, are sometimes suspected. Several pesticides are suspected of causing endocrine disrupting effects, causing hormonal imbalance. The U.S. Environmental Protection Agency, the U.S. EPA, conducts reviews to determine which products have such effects. On the other hand, from effects in animals, researchers believe that certain pesticides are associated in humans with breast, prostate and testicular cancer, endometriosis, sexual organ malformations, reduced male fertility, decreased immune response, and behavioral problems.

Although studies of the effects of pesticides on immune systems are still limited, some suggest the likelihood of a link between exposure to these products and increased risk of infection. Effects such as falling antibody production and delayed hypersensitivity reactions may also be associated with exposure to certain pesticides. Several commonly used pesticides could suppress the normal response of the human immune system to the invasion of viruses, bacteria, parasites and tumors.

Some pesticides, mainly a few insecticides, could also cause neurological effects, both during acute and chronic exposure. These effects can sometimes persist for several years and often without the link of exposure to these products. Effects such as behavioral, psychological, motor, sensory and cognitive difficulties have been reported in the scientific literature. For example, nervousness, depression, difficulty in speaking and concentration, loss of reflexes and tremors were sometimes associated with exposure to organophosphorus insecticides. In addition, more and more studies suggest a significant link between Parkinson's disease and chronic pesticide exposure. There is also evidence that exposure to insecticides could interrupt normal neurological development during the critical period of brain development.

## **CONCLUSION**

With regard to the use of pesticides, inputs/fertilizers in maize cultivation and their impact on human health and the environment, it is possible that we are currently seeing only the tip of the iceberg. Caution is still necessary because of the many uncertainties that remain. In fact, largescale pesticides use a few years ago are now being severely restricted because of their harmful effects on the health of farmers and consumers. Thus, considering the available data, the numerous uncertainties and the particularities of vulnerable groups (pregnant women and young children), there is sufficient evidence to justify the application of the precautionary principle in the use of pesticides.

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