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Impact of Dust Emission from Limestone Mining in Gboko, Benue State, Nigeria

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Abstract

The study of effect of dust emission from exploitation and processing of limestone in some parts of Gboko Local Government Area of Benue State Nigeria, covering latitude $7^0$08' and $7^0$31'N and longitude $8^0$37' and $9^0$10'E was carried out. For this purpose, random sampling was carried out in two localities of Mbadim and Mbadiogo using unstructured questionnaire as primary source, and records from Dangote Cement Plc as secondary source for relevant data. The research revealed that the dust emission from mining and processing activities has caused delay in crop growth, maturity, swollen stems, and eventually death of the crops and as a result, farmers suffered from low economic income due to poor yield and quality of the harvest. Thus the research indicates that the dust emission has negative impact on the environment. It was recommended that, as a matter of urgency, the Federal Environmental Protection Agency and Government of Benue State should encourage Environmental safeguarding, to ensure that more dust-controlling devices be installed in the Dangote Cement Plc that carry out mining and processing activities so as to reduce the incidence of hazard in the area.

Keywords: *Mining, Limestone, Environmental Impact, Benue State, Nigeria*

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Background to the Study

Mining is essential in the economic development plan of any country endowed with mineral resources. This is due to both internal and external economic benefits that are made available to the extraction of mineral resources. Internally, there is creation of employment and revenue generation among others, while externally; a substantial foreign exchange is available to such countries. However, looking at the socio-economic importance of the industry, most countries lose sight of the ensuing effect that might accrue to an area as a result of mining activities.

Mining is any activity that involves excavating the earth surface for the purpose of exploiting its mineral wealth. This could be for local, economic and industrial development or for export purposes (David, 2002) If properly coordinated, it's positive socio-economic impact cannot be overemphasized as it provides natural resources for consumption, offers jobs, as well as a source of revenue and foreign exchange. It also leads to the development of some socio-economic infrastructures like roads, schools, hospitals, among others (David, 2002; Hilson, 2002). The industry has been and in many cases remains important to the socio-economic development of many developed and industrialized countries such as Australia, Canada, Sweden, and the United States. Various cities and regions have built their wealth and industrial development at least in part, on mining (Kankara, 2019c).

Historical examples include Monterrey in Mexico, Colombia, among others (Akande and Idris, 2005; Imasiku, 2008). In developing countries also, mining will continue to provide technological development and employment. According to Imasiku (2008), large-scale mineral exploitation has contributed over 90% of all foreign exchange earnings, 60% of Gross National Product, 50% of total government revenue and 30% of total employment in some Southern African Countries. Similarly, small scale mineral exploitation provides a source of livelihood for those in rural and semi-urban Africa.

If not properly organized however, it can result to various environmental problems. This, according to Maponga (1995), has made mineral exploitation to be of global interest. The industry's operations ranging from prospecting to excavation are seen to be causing several environmental problems ranging from erosion, pollution, formation of sinkholes, vegetation loss, bio-diversity loss, heavy metal and organic contamination of groundwater and surface water (Mason, 1997). He also asserted that mining causes massive damage to landscape and biological community as plant communities get disturbed and subsequently become impoverished thus presenting a very rigorous condition for its growth. According to the author, the dumping of mine overburden results into several destruction of surrounding vegetation and this leads to severe soil and water pollution.

Following the discovery of limestone traces in Mbayion, Gboko Local Government Area of Benue State in Nigeria in 1960, a cement plant was established within the region and it commenced operation in 1980, that was 20 years after. Subsequently, in 2004, with Dangote Industries Plc. as the new management of the company, an aggressive upgrading and rehabilitation of the plant was carried out and this has subsequently transformed the company into a new state-of-the-art cement factory with 1.4 million tones lines (Vetiva, 2010). Due to increase in quarrying activities caused by the upgrade of the processing plant within the study area, the natural vegetation belt of the area which is characterized with the presence of tall grasses such as elephant grass (*Pennistrumpurpureum*), spear grass (*Heteropogoncontorous*), Guinea grass (*Panicum maximum*), Rhodes grass (*Chlorisgayama*) and tall trees like Locust Bean trees (*Parkiafilicoidea*), Shea Butter trees (*Butyrospermumparkii*) and Mangoes (*Mangiferaindica*) are threatened as it has to be cleared to give room for mining activities. The consequences of vegetal deterioration within the study area are however enormous with various environmental and economic implications as agriculture is the main source of income for people living within the study area. Against this backdrop, the assessment of the impact of mining and processing of limestone on soyabeans production in Mbayion especially as it affects the environs and the entire community becomes necessary.

The typical gaseous emissions to air from mining and processing manufacturing plants include nitrogen oxide (NOx), sulphur dioxide (SO2), carbon oxides (CO & CO2) and dust. The dust escaping from cement factories is often transported by wind and deposited in areas close and far away from the factory (Mubarak and Kankara, 2020). These include agricultural lands, natural vegetation, towns and villages, such depositions of particulate matter and other pollutants interfere with normal metabolic activities of plants, causing direct injury and impairment of growth and quality and may ultimately lead to decrease in plant yield (Saasongo, 2017). The cement kiln dust, containing oxides of calcium, potassium and sodium is a common air pollutant affecting plants in various ways i.e. cement dust and cement crust on leaves plug stomata and interrupt absorption of light and diffusion of gases, lowering starch formation, reducing fruit setting, inducing premature leaf fall, and leading to stunted growth (Akande and Idris, 2005). Besides causing suppression of plant growth, cement dust induces the change in the physico-chemical properties of soil, which are generally unfavorable to plant growth (David, 2002) In comparison to gaseous air pollutants, only limited studies have been carried out on the effect of particulates air pollutants on plant as reported with respect to fluoride dust soot, lead particles, cement dust and coal dust (Saasongo, 2017). This study was carried out to assess the impact of dust emission from mining and processing of limestone/cement on crops planted, most particularly the soya beans production in Mbayion and its environs.

Statement of Research Problem

Generally, industrialization, like every phenomenon that has benefits also has negative consequences (Kankara, 2019c) The impact of mining and processing limestone on water, land, vegetation and crops production including forest ecosystems has become a matter of serious concern. Acknowledging the economic contributions of mining and processing of limestone, however, several economies lost sight of environmental effects associated with mining activities. In many parts of the world, particularly in developing countries, where minerals are extracted using crude mining methods, or even, operating outside the legal and regulatory frame-work, it results into pollution, direct dumping of waste and effluents into rivers, improperly constructed dams, river damage in alluvial areas, river siltation, erosion, deforestation, vegetation loss, landscape destruction among others as cited by Hentschel et al, (2002); Mason (1997) and Maponga (1995). Nigeria being a developing country belongs to where these types of activities have the potential to thrive and indeed are thriving Adekeye (2001). In Nigeria however, the history of mining dates back to the colonial era between 1903 and 1904, when the Secretary of State for Colonies conducted mineral surveys of the Southern and Northern Protectorates. Mining has generated substantial revenue to the government and contributed immensely to the socio-economic development of their host communities (Saasongo, 2017).

For example; exploration and exploitation in Sagamu, Okpilla, Ewekoro, Ashaka and Gboko owing to quarrying of limestone and the establishment of Portland cement manufacturing company. These desirable effects of mining can however be overshadowed by adverse effect if not checkmated as outlined by Mokobia and Balogun (2004); Olaleye and Oluyemi (2010) to include geological disturbances, destruction of fauna and flora, air pollution, landscape degradation among others. It is in view of the above fact that the researcher seek to assess the impact of dust emission from mining and processing of limestone on soya beans production in Mbayion, Gboko LGA of Benue State.

The Study Area

Location and Geography (Physical Background)

Gboko LGA (Figure 1), which is located in the Northern part of the State is situated between latitudes $7^0$08' and $7^0$31'N of the equator and longitudes $8^0$37' and $9^0$10'E of the Greenwich Meridian. It is made up of five (5) Districts namely: Mbatyiav, Mbayion, Mbatyerev, Yandev and Ipav. Mbayion which is among the five (5) districts and the study area is situated between latitudes $7^0$16' and $7^0$28'N of the equator and longitudes 8048' and $9^0$00'E of the Greenwich Meridian. It shares common boundaries with Takar Local Government in the North, Yandev in North-East, Ipav in South-East, Ushongo Local Government in the South, Mbatiav in South-West and Mbatierev District in the North-Western part of the Local Government, as shown in Figures 1 and 2.

Soil and Drainage

The predominant factors that have influenced the distribution of soils within the study area are relief and vegetal cover. Within the area, the predominant soil is tropical ferruginous soils; coarse loamy soils, laterite soils as well as sandy soils (BENSEED, 2004; Iwena, 2008). According to BENSEED (2004), the presence of clay soils near streams and valleys, are however mixed with a reasonable amount of sandy soil and as such most parts of the area is adequately drained and free from water.

With respect to drainage, the major rivers that drain the State are the Niger-Benue River and Kastina-Ala rivers. According to Ujoh and Alhassan (2014), however, Mbayion the study area is about 532 feet above mean sea level and as such it is characteristically a flat plain without hills or rocky outcrops. Having two most significant water bodies (streams) and these includes; Ahungwa and Oratsor.

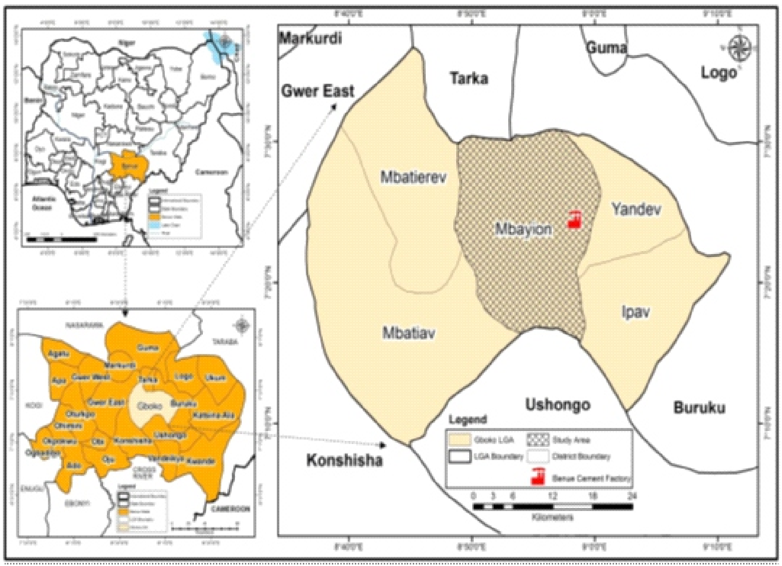

Fig. 1: Gboko LGA Showing the Study Area
Source: Administrative Map of Gboko LGA, 2014

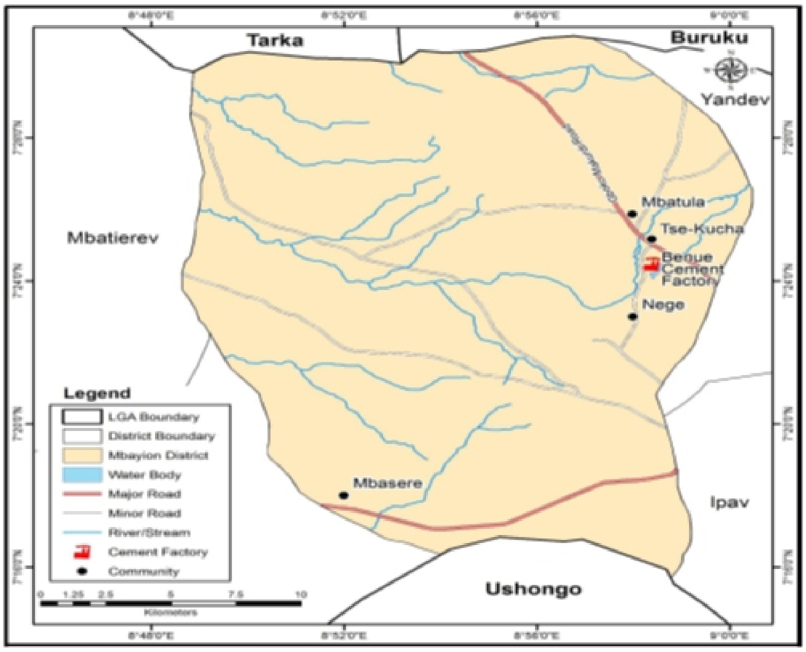

Fig. 2: Mbayion District (Study Area)
Source: Administrative Map of Gboko LGA, 2014.

Climate

The study area is located within a sub-humid tropical region around the tropical wet and dry climate which is designated as AW by Koppen's climatic classification. It generally has an annual mean temperature range of 23°C to 34°C (Ikejiaku, 2007). In general, the study area is characterized by two distinct seasons: the dry and wet season. The dry season, starts from late November and last till March. During this period, the tropical continental air mass, dominates the area and Harmattan winds, which are characteristically dry, cold and hazy, prevail. The wet/rainy season on the other hand starts from April and ends in November, and it is characterized by the tropical maritime air mass which brings rainfall and wet conditions to the area (Ujoh and Alhassan, 2014)

Rainfall reaches its peak between the months of July to September, spreading between six (6) to eight (8) months yearly. The rains which are usually torrential in nature are accompanied with a lot of lightning and thunder, associated with occasional thunderstorms of short duration especially when raining season is at its peak. The mean annual precipitation according to Ujoh and Alhassan (2014) is about 1,370mm and it is described by Saasongo 92017) as having a bimodal pattern. The average wind speed over the study area is about 1.50 m/s, while the average ambient air temperature is about 30ºC (Saasongo, 2017)

Materials and Methods

Geology and Relief

Around the East-central part of the LGA which comprises basically of the study area (Mbayion), basement complex rock outcrops cover an area of about 100Km2 consisting majorly of granites and gneisses with the body been surrounded by early cretaceous sediments. These sediments where deposited around the Gboko area along a steepened slope consisting of three main deposition centres such as the Tse-kucha deposition centre within Mbayion District (the study area), Akpagher deposition centre as well as the Mayange deposition centre which were formed during the cretaceous.

During the period, the sub-basins where filled with shale, clays and carbonates. According to Najime, (2010) and Najime (2010), the deposition of these mineral which further resulted to the formation of limestone intervals in Gboko (which contains calcareous benthic foraminifers species and a lagoonal or estuarine condition for the non-carbonate intervals) was due to the south Atlantic sea rise and subsidence along the Benue Trough during the middle Albian. According to Ikejiaku, (2007), subsequent intrusions that punctuate the gently undulating terrain of the area, further caused these deposits to be backed giving rise to the formation of limestone, clay and shale within the region.

The area according to Wright et al (1985) is largely covered by Cretaceous continental sediments of basement complex rocks (to the north) and marine sediments of clay and shale (to the south) causing the limestone reserves within the study area to be mostly of Cretaceous sedimentary formation. According to Ikejiaku (2007) the average limestone within the area has a thickness of over 80m with a quarryable reserve area of 1.5 Km^2 with the mineral reserve standing at over 35.4 million metric tones. The calcium carbonate (CaCo3) content of the limestone within the study area according to the author is over 80% indicating that the mineral is suitable for cement production.

Review of Related Literature

Among the Volcanic eruption phenomena, the first is the volcanic aerosols which forms the stratosphere after major volcanic eruption. The dominant aerosols layer is actually formed by sulfur dioxide gas which is converted to droplet of sulfuric acid in the stratosphere over a week to several months after the eruption. Winds in the stratosphere spread the aerosols until they practically cover the globe. Once formed, these aerosols stayed in the stratosphere for about two years. They reflect sunlight, reducing the amount of energy that would have reached the lower atmosphere and the earth surface thus, cooling the sun rays.

The relative effect of aerosols is not just on crops alone but it also affect the physical factors as noted earlier. This has a significant influence on the crop production, since the process of aerosols stayed for about two years or more in the stratosphere, preventing the physical environmental factors by reducing the amount of sunshine energy that would have make the crops grow or produce effectively.

The desert aerosols have significant effect on climate. The particles in this regard are minute grain of sands blown from the deserts which are relatively smallish in size. They normally fall out of atmosphere after a long flight, if they were blown to relatively high altitude by intense dust storm. Although, this type of aerosols that affect the climate of the study area has no effect on the soya beans production simply because, the desert dust from the Sahara desert arrive the study area at the time the crops has been already harvested which is between November to December.

Method of Data Collection

Since unstructured questionnaire was used in collecting the primary data, the structure need not to be displayed within the text of the research, so also the data gathered from the Dangote cement company, as the secondary sources of data. The data itself need not to be displayed or shown, but the interpretation of the data is mostly desirous.

Several researches have been conducted on mining and its effects as well as contributions to economic development of countries endowed with mineral resources. Whereas some researches highlight the benefits of mining to economic development, others focus on the negative impacts of mining on the overall development of such economies and the relationship between mining and economic development as well as its impact on the production of soya beans in the study area. For this purpose, the data was sort for using the primary and secondary sources. The primary source was collected using questionnaires, personal observation, and personal interaction. Whereas, published and unpublished books, Government and International Reports, Journals, Newspapers and Magazines, internet, and records from Dangote Cement Plc were used as secondary data in order to assess whether dust emission from mining and processing activities have impact on soya beans production or not.

Plate 1: Showing some causes of dust emission in the study area, and Plate 2: Dangote Cement Company (Gboko LGA)

Results and Interpretations

Obeying The Karl Pearson's Correlation Coefficient

$$r = \frac{n\sum(xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2] - [n\sum y^2 - (\sum y)^2]}}$$

Where:

r = correlation coefficient

n = sample size

x = sample x

y = sample y

$\sum$ = summation sign

$\sum xy$ = sum of the product of x and y

x^2 = x to the power of 2

$y^{2=}$ y to the power of 2

$(\sum x)^2$ = square of the sum of x

$(\sum y)^2$ = square of the sum of y

Interpretation of Result

The study provided an insight on the impact of dust emission from mining and processing of limestone on soya beans production in Mbayion and its environs, Gboko LGA of Benue State (Plates 1 and 2). This study has the following specific objectives to meet up with: To determine whether the impact of mining and processing of limestone on soya beans production in the study area is positive or not. To determine the causes and or reasons for the dust emission. Determine the level of dust emission and soya beans yield in the study area. To identify other variables that might have been affecting soya beans production rather than the emission of dust from mining and processing limestone. To suggest the possible solutions to the prevailing factors if found in the study area.

The research revealed that, the emission of dust from the activities of mining and processing limestone has continually reduced the level of soya beans production and subsequently the yield over the period of ten (10) years from 2004-2013 As investigated, it has shown that 69.8% of farmers reduced their farmlands yearly due to poor yield/harvest which is as a result of dust emission from mining and processing activities that leads to delay in growth or stunted growth of the crop, swollen stems, black and white patches on the leaves of the crop and subsequently death of the crop. However, other variables or factors such as diseases and pest, weed, depletion in soil fertility, shortage of rainfall among others has also contributed to the problem of soya beans production in the area.

1. Experimental Observations

According to (Mary and Ralph, 1971), there are three types of aerosols that significantly affect an area during mining, they are human made, volcanic and an air pollution aerosols. In this study, volcanic aerosols are excluded. An assessment of cement dust impact on the soil using principal component analysis and GIS evaluated by Zerrouqi, Z., et al., (2008) and demonstrated the preliminary results that this dust are especially basic and contain a high free lime (43% CaO).

Air pollution is one of the most serious environmental problems in Tehran and it is evaluated and predicted by Siamak and Alireza (2009) that the rate of pollutants being generated in the cement production industries and discussed the approaches to eliminate and control the pollutants (Mubarak and Kankara, 2020). The variation in the degrees of exposure to elements in cement dust and health implications arising from working or living within the vicinity of a cement company was monitored and investigated by Sabah and Abdul (2006) and resulted highlight the hazards of prolonged exposure to cement dust and underscore the need for urgent action for the protection of animals and plants.

Also, dust from mining and processing of limestone/cement affects directly the quality of soil, as it adds number of harmful substances to it. Although, the basic constituents of cement dust are calcium ($CaCo3$), silicon ($SiO2$), aluminum ($Al2O3$), ferric and manganese oxides (Akande and Idris, 2005) its production produces known toxic, carcinogenic and mutagenic substances, such as particulate matters, sulfur dioxide, nitrogen dioxide, volatile compounds, long lived dioxins and heavy metals (Kankara et al, 2019a). The calcinations and burning processes of cement production produce poisonous gases that cause injuries to plants and animals (David, 2002). Cement dust causes numerous hazards to the biotic environment, which have adverse effects and toxicological risks for vegetation, animal health and ecosystems. Plant growth parameters, yield and yield components of crops can be considerably influenced by excessive metal accumulation in soil (Kankara et al, 2019a).

The particles of cement deposits are quite alkaline making soils of neighborhood alkaline and changing its other properties which in turn affects vegetation growth, decreases chlorophyll content thus decreasing photosynthesis rate as chlorophyll pigments are essential component for photosynthesis, decreasing respiration rate, reducing transpiration and thus growth rate (Adekeye, 2001) studied the impacts of cement pollution on morphology of Saffron plant and its productivity. One of the important aspects is decrease in chlorophyll content. A decrease in chlorophyll has been used as an indicator of an air pollution injury (Ujoh and Alhassan, 2014). Decrease in chlorophyll „a" chlorophyll „b" and Total chlorophyll content in fresh tissues of affected leaves might be due to chloroplast damage by incorporation of cement dust into foliar tissue.

Similar observation have also been made by Maponga, 1995) with stone crusher dust and by Imasiku, 2008) with cement dus are of the opinion that the alkaline conditions caused by solubilisation of dust in cell cap may be responsible for chlorophyll degradation vis–a-vis photosynthetic efficiency. However, Mehrotra (2001) indicated that decrease in chlorophyll is due to induced Iron deficiency caused in excess of Calcium supply. A number of workers have reported the similar results has suggested that continuous application of cement clogs the stomata, and thus interfering with gaseous exchange.

This may lead to increased leaf temperatures which may retard the chlorophyll synthesis (Warhurst, 1999). Chlorophyll may be destroyed in cells under cement cover. Reduction in chlorophyll content in the cement affected plants and in the leaves can be attributed to the effect of Nitrogen oxides and Sulphur dioxide released from the factory as the pollutants. The appreciable reduction in chlorophyll contents in Sulphur dioxide treated plants were also noticed by some other workers like (Warhurst, 1999)

Besides morphological and physiological changes in plants, there also occurred biochemical changes because of cement dust such as decrease in protein contents , change in proline level, total free amino acids, reducing sugars, abnormality during mitosis, chromosomal breakages etc. Besides gaseous and particulate pollutants there are also enhanced levels of other elements (metals and non- metals) in cement dust which cause numerous effects on plant which includes decrease in yield, seed germination, leaf area and water content of the leaves (Sivakumar and Britto, 1995). Among the elements most toxic are heavy metals, as cement dust contains a number of heavy metals such as Mercury, lead, nickel, chromium etc. These cause cytogenic as well as mutagenic effects such as decrease in plant growth, low pollen fertility, decrease in seed yield, decrease in total protein levels, chromosomal stickiness in meiosis phase, c-mitosis, chromosomal bridge, chromosome fragmentation, vagrant chromosomes, bi-nucleus chromosomes and multi-polar anaphase and DNA fragmentation (Adekeye, 2001).Among heavy metals Mercury plays an essential role. Mercury is a typical toxic metal pollutant.

2. Human Made Aerosols

These aerosols are purely generated as a result of human activities. Human activities that have led to the generation and emission of aerosols include mining, industrial processes, agricultural practices, construction and many others (Mary and Ralph, 1971). Human made aerosols comes in form of dust particles, smoke, and sulfate. Sirvakumar and Britto (1971), in their opinion aerosols deposit on the leaves of plants and on the chemical composition of the soil on which plants grow, thereafter affecting normal growth and productivity of crops. For this reason, aerosols generated and emitted in the study area by mining and processing of limestone cannot be exceptional. It will also exert the same effect.

3. Generation of Aerosols

Aerosols are purely generated pollutants liberated as a result of exploration and mining of limestone, and its industrial processes in the area (Kankara et al, 2019b). They come in form of dust particles or smoke and are deposited on the leaves of plants and on the chemical composition of the soil on which plants grow, thereafter affecting normal growth and productivity of crops.

4. Air Pollution

Mubarak and Kankara (2020) observed air pollution as a significant factor in morbidity and mortality within developed and developing industrial areas around Gboko, Benue State. Hazardous substances are dispersed/distributed or suspended widely in the Mbayion ecosystems due to diverse natural and human activities; such as energy usage, exploitation and or mining operations, intensive agriculture, urbanization and industrialization, high demand of infrastructure due to population increase. Cement production is one of the sources of air pollution and the main impacts of the cement activity to the environment are the broadcast of dusts and gases (Kankara et al, 2019b). The effect of dust emitted by the building materials industry on plants may be neutral, stimulating or toxic depending on the type, concentrations of components, level of deposition and meteorological conditions.

5. Cement Kiln Dust Pollution

Some researchers studied the cytogenetical effects of cement kiln dust. There is also a Mitotic index which describes a decrease as concentration of the dust materials increase. Different kinds of chromosomal abnormalities were recorded. There was a direct relationship between the frequency of aberration and cement kiln dust treatment. The results indicated that cement kiln dust has cytotoxic properties and even acts as a mutagen. Olaleye and Oluyemi (2010) presented the impact of cement kiln dust pollution on the molphobiochemical and epidermal features of H. cannabinus plants grown under simulated cement kiln dust pollution.

Saasongo (2017) gave the report on the effect of cement dust pollution on soybean (Glycine max (L.) Merrill cv. PK 472) leaves from dusted and undusted plants till their physiological maturity.

Due to cumulative accumulation and encrustation of cement dust on leaves, a gradual decline in chlorophyll content was observed. Although chlorophyll a was found relatively more sensitive to the cement dust than chlorophyll. Quantitative estimation of certain metabolites such as protein, starch and sugar content also showed a considerable decrease. The periodical effect of cement dust pollution on the growth of some plant species was presented by Yahaya and Joy (2011) Mehrotra GK (2001) reported the ambient air quality in and around lime and cement producing regions of Madhya Pradesh state, namely the districts of Rewa, Satna, Maihar and Katni has been made. Dust fall and visibility loss measurement at a distance of 100 m at important places have shown marked deterioration in air quality at various points.

This has been attributed to the physical and chemical characteristics of the raw materials and coal used in the manufacturing of lime and cement. The high resistant and sensitive plant species were identified by Mason (1997) in the vicinity of a cement factory in Ariyalur, through the determination of air pollution tolerance index (APTI) using four leaf parameters. The result indicated that out of fifteen woody plant species only eight were found to be resistant to cement kiln dust pollution.

Mason (1997) investigated the cumulative encrustation of cement dust on the leaves of soybean and maize, a quantitative reduction in the absorption of light by these plants was observed, which affected fluorescence yield. Mokobia and Balogun (2004) examined cement production externalities and profitability of crop enterprises in two Local Government Areas of Ogun State, Nigeria and reported that negative effects on agricultural production due to soil and air pollution in the selected areas. Sabah A. Saasongo (2017) estimated the impact of fugitive particulate emissions from a cement plant on a nearby community using an air quality model (fugitive dust model, FDM) The emission rates of dust from various activities of the cement plant were estimated by using the emission factors technique. The results of the study showed that the agreement between the 24-hour averages predicted and measured dust concentrations were excellent and the plant that are at risk of approaching or exceeding guideline TSP concentrations.

Sivakumar and Britto (1995) presented the application of pine bark to indicate the level of air contamination by cement-lime dust and determined the impact range of cement plants. The pine bark was analyzed in the forested formed around three cement plants in the Swietokrzyski district of south Poland and compared with control and resulted the high alkalinity range in the bark of polluted pine tree.

The climate-growth relationships and the variation of the radial growth of Norway spruce and Scots pine stands in conditions of different cement dust loads were investigated by Hentschel et al, (2002) and it is concluded that cement dust emissions had a small effect on the radial growth of selected plants. Again, Siamak and Alireza (2009) investigated the effect of cement dust pollution on Celosia Argentea and resulted it may discourage the practice of vegetable gardening in areas under cement dust pollution. Olaleye and Olufemi (2010) studied the pollution by the cement dust has caused adverse effects on the photosynthetic pigments, the pH of the cell sap, metabolism of soluble amino acids and soluble sugars.

Discussion

The study sought to provide an empirical study to ascertain whether or not dust emission from mining and processing activities has impact on the environment and the plant ecosystem in the study area.

There must be the need for Environmental awareness, in consideration of aerosols, which are minute particles suspended in the atmosphere during mining. When they are sufficiently large, then their presence is noticed as they got scattered and aborted sunlight. Their scattering can reduce visibility and photosynthesis the crops would have received from radiation energy. .

Conclusion

This research work examines the impact of dust emission from mining and processing limestone on the production of soya beans in Mbayion community and its environs. The result obtained from the study have shown that dust emission in the study area have a negative effect of 0.015% on the production of soya beans as tested using Karl Pearson's coefficient of correlation. Going by the assertion above, it has revealed that dust emission in the area causes delay in growth, late maturity, swollen stems and eventually death of the crop (soya beans) which leads to low economic earning due to poor quality and quantity of the yield.

Recommendation

Based on the identified impacts or effects within the study area attributed to mining and processing activities, the following are recommended:

1. Relevant government agencies such as Federal Environmental Protection Agencies (FEPA) and the Government of Benue State should as a matter of urgency ensure that more dust controlling devices be installed in the Dangote Cement Plc that are carrying out mining and processing activities so as to balance the ecosystem and to reduce the incidence of hazard on the production of crops produced in the study area.
2. In order to reduce the negative impact of the dust emission on soya beans and other agricultural products production, government should encourage agricultural research institutions by financing them with money and necessary equipment to produce dust resistance variety of soya beans that will resist the prevailing conditions in the study area.
3. The agricultural lands or farmlands in the study area should be rehabilitated and, or reclaimed so as to regain their fertilities.
4. Creation of awareness to the farmers in the study area to change from using local soya beans seedling to genetic modified seedling that is capable of adopting or resisting dust emission.

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