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THE IMPACT OF BUSH BURNING ON SUSTAINABLE AGRICULTURE IN NIGERIA

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ABSTRACT

Bush burning is the indiscriminate setting ablaze of farmland in an attempt to achieve adequate and efficient land preparation. It has been a cultural practice in crop production for several years. Bush burning is a common practice in many parts of the world and is an integral part of traditional agriculture in tropical Africa and parts of Asia. This review attempts to describe the effects of bush burning on sustainable agriculture in Nigeria. To achieve this, the concept of a sustainable Agricultural Development system was discussed, and an overview of the meaning, types of bush burning, and its impacts on sustainable agriculture were presented. Evidence from previous works revealed the consequences of bush burning and the differences between burnt and unburnt plots after a field trial. Legislations against indiscriminate use of fire must be enacted and implemented succinctly by the Government to combat bush burning by farmers, hunters and the general public in their operations and activities. In addition, fire service facilities and offices should be provided and built in rural areas to fight against fire outbreaks, especially on agricultural lands and forest reserves. Affected persons by fire outbreaks should be supported financially and with agrarian inputs to boost food production.

Keywords: Bush burning, Wild fire, Effect, Sustainable agriculture and Food security

INTRODUCTION

Land clearance is the first stage in any crop production system, and bush burning is common. Burning is introduced purposely to eliminate leftover materials from plants and growing vegetation to promote successful farm operations. The cleared materials set on fire are under control monitoring. The persistent use of this system often results in annual bushfires. In localities, people fire the bush or forest for crop or livestock production and sometimes for hunting. It has remained the cheapest and easiest land-clearing method over the years, with disadvantages not being known or considered by farmers. Its consequences emerged with time, awareness campaigns, and research findings through demonstration plots between burnt and unburnt plots.

Aliero (2004) revealed that bush burning had been practised from time immemorial and, in many societies, has been accepted as an integral part of traditional agriculture. The author added that the changing pattern of lifestyle, population increase, urbanisation and farming systems put heavy pressure on the natural environment, suggesting that the traditional system of bush burning can no longer be sustained. Still, it seems complicated to reduce or completely eradicate. Hamid *et al*. (2010) observed that bush burning, as it is being studied, poses health hazards to man alone and affects the environment in general via the emission of various pollutants.

By 2025, the population of sub-Saharan Africa (SSA) is estimated to double. A significant concern is how to feed the population of over 480 million (without South Africa), whose 3 per cent rate of annual population increase is about the highest in the world (Ezumah*et al*., 1993). Food production in developing countries is estimated at 1223 million metric tons (mt), which must be increased by 778 million mt or 2.5 per cent between 2000 and 2005 to meet the needs of an increased population and projected change in diet (Lal, 2005). On the other hand, with population growth projected at a billion by 2050, and 70% of this number coming from Africa and Asia, organisation and income growth in developing nations across the globe, there has been a corresponding increased demand for food and animal protein as food preferences continue to grow (Sandy and Camilla, 2010).

The increase in food preference worldwide, owing to economic growth in developing nations, climate change and resource scarcity, has aggravated the competition between crop and livestock

farmers as the cropped areas are increasingly expanding at the expense of grazing lands. Also, technological evolutions in production systems involving agro-machinery, chemical fertilisers and pesticides for intensification of production without sustainable management practices are overstretching the capacity of the natural production base and exacerbating environmental problems (Richard and James, 2013).

Conventional agricultural intensification programs to boost crop and livestock production through chemical fertilisers and pesticides are becoming uneconomical and unproductive. This causes soil, pasture, and environmental degradation and bio-diversity depletion, with the situations made worse in marginal lands, with problems of water shortage and desertification, as is currently experienced in the northern fringes of West Africa, including Nigeria. According to Aboje (2020), there is an urgent need for crop and livestock production and management systems to aim at:

1. Sustaining high production levels while mitigating the hazardous effects of intensive farming for soil, water and environmental preservation.
2. Developing a production system that will continue to enhance the natural biological processes above and below ground,
3. Practising a system that will help to curb the menace of soil wash and erosion,
4. Increasing crop and pasture yield;
5. Creating a system can enhance soil biological activities and natural nutrient recycling, strengthen environmental sustainability, increase crop and livestock productivity, and reduce poverty and malnutrition.

In addition, poor infrastructure for crop production, handling and marketing, compounded by climatic extremes that characterise Sub-Saharan Africa into ecological zones, causes fluctuations in food availability and, subsequently, hunger (Ezeaku and Unagwu, 2013). Hence, the World Bank (1989) observed that about 100 million inhabitants of Sub-Saharan Africa (or 25%) consume less than 80% of the food requirement recommended by the Food and Agricultural Organization (FAO), including the proportion filled by food imports. Because the food security of most of the Sub-Saharan Africa population that depends upon farming is directly influenced by agriculture, emphasis on agricultural productivity and related activities will alleviate the food deficits of the

most vulnerable poor. Therefore, production increases and should be sustained long-term (Ezeaku and Unagwu, 2013).

Bush burning has been a threatening factor to an ecosystem for several years. Its consequences lead to unfavourable soil conditions by distorting its physical, chemical, and biological properties, affecting microbial activities, and causing environmental pollution that affects man and his activities. However, it should be noted that one of the factors responsible for the food deficit is low yield, which may be due to poor management practices such as deliberately setting fire to farmlands. Understanding the adverse effects of bush burning on traditional agriculture is essential to farmers. Soil as a medium for crop growth must be conserved to maintain quality and promote agricultural productivity and sustainability. Unarguably, bush burning is one of the critical factors affecting soil's physical, chemical, and biological properties. Therefore, bush burning must be avoided to make the soil more fertile and productive.

This paper explains the meaning and types of bush burning and highlights its side effects on humans, plants, animals, and the environment. It also emphasises the concept of sustainable agriculture and the possibility of bush burning hindering its growth, productivity, and sustainability. Possible means of averting bush burning to enhance food production and ensure food security were advocated.

Concept of Bush Burning

Bush burning is a pre-planting operation practised by farmers to ease land preparation and destroy surface litter, weed seeds and soil-borne pathogens (Aliero, 2004). According to Tainton and Snyman (2003), bush burning involves introducing fire to remove moribund and unpalatable grasses from the previous growing season and stimulate the growth of fresh herbage with higher nutrients. Auid and Denham (2006) describe bush burning as setting fire to rid the grassland of parasitic insects and prevent the encroachment of undesirable invasive species. Hough (1993) believes that bush burning refers to clearing land for agriculture, maintaining a grassland, controlling pest and disease vectors, and removing dry vegetable and crop residues to promote agricultural activities.

Odedokun (2008) elucidated that bush burning is the setting of fire on a piece of land where grasses, legumes, shrubs and trees are found to keep them under control. Ambe *et al*. (2015) expatiated that bush burning is the indiscriminate setting ablaze of the vegetation cover and the burning of grassland and forest resources by fire. To the farmers, it is the cheapest means of clearing farmland. To the nomads, it is the easiest way of clearing garbage to allow for early fodder sprouting for the animals; the hunters say it is a technique for hunting games. Others set fire for the pleasure of it. From the foregoing definitions, bush burning can be defined as setting fire on a piece of land to eliminate shrubs, weeds, or crop residues and provide an enabling environment for land tillage, crop planting, and animal raising.

Artificial Bush Burning or Controlled Burning

This refers to the setting of fire by farmers to create a favourable environment for agricultural production, which involves the removal of unwanted vegetation. Artificial bush burning is used extensively on farmland and in forests to reduce the accumulation of litter and household waste. This type of burning occurs when environmental conditions are favourable and wind is minimal (Alfred *et al*., 2006). Burning is said to be artificial or controlled if particular species of grasses or legumes are not allowed to be consumed by fire or when the bush is localised in a specific zone of the bush. It is a common practice in West Africa (Odedokun, 2008).

Natural Bush Burning or Uncontrolled Burning

This refers to accidental wildfires that occur as a result of high temperatures (between 400 and above) that are known to destroy large areas of land in different parts of the world, most especially in the tropics. Australia is a good example of a country that has been experiencing incidences of wildfires. Records have shown that biodiversity and other ecological resources are lost due to wildfires (Alfred *et al*., 2006).

Insights into Bush Burning Incidences

Robinson *et al*. (2003) reported that many fire-tolerant species possess adaptive features that enable them to survive; some even require fire to complete their lifecycle. They added that fire-sensitive species are destroyed by fire and can become locally extinct if burning is too frequent or too intense. Lunt and Morgan (2003) observed that grasses mostly survive fire by lowering their

buds below the soil surface. According to Paltridge and Latz (2009), fire-tolerant plants are eradicated by burning and replaced by fire-sensitive plants. A fire incident followed by a heavy rain six weeks later in Australia was reported to have resulted in a mass of flowering annuals and seedlings shortly afterwards, and nearly a year later, 63 were new to the site. In contrast, the unburnt area showed no such effect.

Pyke*et al*. (2010) reported that fire can change plant communities by reducing the dominance of others. Akinsoji (2013) reported that in comparing burnt and unburnt plots at Olokomeji Forest Reserve, there was a low diversity of plant index, change in vegetation types, and the dominance of some trees in burnt plots. In contrast, the unburnt plots had the highest diversity index and the presence of more fire-sensitive species. Gandiwa (2011), following a similar study in Bulawayo, Zimbabwe, reported significant differences in plant density, number of species per plot and number of woody species per plot between burnt and unburnt plots.

Aregbesola (2002) stressed the need to review the law prohibiting bush burning and the mechanism for its enforcement in Nigeria to make it more effective. He affirmed that it would be included in the mandate of forest rangers. This obnoxious practice's economic loss and environmental damage are enormous and incalculable. He further stated that although there are naturally occurring fire incidents, most are artificial, either accidentally, negligently or intentionally. He, therefore, suggested that mass media sensitisation of Nigerians is necessary to combat fire incidences of all sorts. He added that aeroplanes with huge packs of suppressants would help extinguish large-scale fire outbreaks, particularly on arable and reserved lands.

Concept of Sustainable Agriculture

The overall development of an economy is anchored by agricultural development. It is, therefore, imperative to state that sustainable development is assured through sustainable agriculture. Agricultural production has intensified, resulting in environmental problems that need to be sustained. In the nations of sub-Saharan Africa, the implication is to ensure that the natural resource base is not damaged as production is intensified to feed the ever-growing population (Ehui and Hertel, 1989; Ehui and Spencer, 1990). The need for sustainable agriculture is particularly significant in the humid tropics, where climatic extremes and highly weathered acidic

soils create unfavourable conditions for crop production. Together with a high human population, overgrazing, deforestation, urbanisation, bush burning and a poorly developed technological base, these factors have produced agricultural systems that cause considerable resource depletion.

The first step and biggest challenge in solving the problems of agricultural sustainability in the tropics is gaining an understanding of the farming environment, its physical and socio-economic dimensions, and the production systems for different crops. A necessary second step is assisting farmers in identifying technologies that can be used to produce enough food for a growing population while conserving natural resources (Akobundu, 1993).

Several scholars have examined the concept of sustainability, either as applied to agricultural systems or in a manner they can use (Pearce *et al.,* 1990). There is a general agreement that projects within agrarian development should be accepted not based on the net present value but on whether the resulting environmental benefits compensate for ecological damages caused elsewhere. Sustainable agriculture is one that, over the long term, enhances the environmental quality and the resource base on which agriculture depends; provides for basic human food and fibre needs; is economically viable; and improves the quality of life for farmers and society as a whole (Francis and Youngberg, 1990).

Conway (1985) viewed sustainability as the ability of a system to maintain its level of productivity despite a significant disturbance, such as caused by an intense or considerable perturbation. Dover and Talboty (1987) emphasised a sustainable production system as one whose productivity continues indefinitely with no noticeable ecosystem degradation. The sustainable agricultural production system maintains an acceptable and increasing level of productivity that satisfies prevailing needs and is continuously adapted to meet future needs for improving the carrying capacity of the resource base and other worthwhile human needs (Okigbo,1989). Thus, a production system leads to the development of people if it results in advancement from the current position. Development attains a sustainable level when its processes are controlled and perpetuated by resources within the reach of and /or controlled by the system such that any external influences do not upset the equilibrium attained (Okigbo,1989).

Failure to attain sustainable agricultural development in sub-Saharan Africa is blamed on plagues of climate, ecological, and socio-economic problems, weak institutional policy reforms, and poor infrastructure for crop production, handling, and marketing. These factors cause fluctuations in food availability and, subsequently, hunger, as well as adverse effects on economies (Ezeaku and Unagwu, 2013).

Effects of bush burning on agriculture and the environment

Bush burning may lead to the following adverse effects:

1. The entire loss of a farm, thereby leading to a food shortage.
2. Destruction of existing vegetation, forest reserves and games therein
3. Destroying of the parenting organs such as rhizomes and stolons (Odedokun, 2008)
4. The emergence of new weed species that may be more evasive and obnoxious (Paltridge and Latz, 2009).
5. This causes imbalances in the ecosystem's stability (Odedokun, 2008).
6. Killing valuable species of insects and their eventual extinction
7. Loss of plant nutrients, especially non-metallic elements such as sulphur, nitrogen, and phosphorous, among others.
8. Depletion of soil organic matter (Liu *et al*. 2001).
9. The development of unfavourable soil pH can result in excessive availability of some micronutrients, which are detrimental to crops (Alfred *et al*., 2006)
10. Loss of soil moisture or their existence in unavailable forms (Robinson *et al*., 2003).
11. Bush burning can lead to soil erosion (Auid and Denham, 2006).
12. Bush burning increases the soil temperature after the destruction of vegetative cover and exposes the soil to the direct impact of sunlight.
13. Reduction in microbial activities can occur after bush burning (Taintom and Snyman, 2003).

CONCLUSION

Bush burning is an unsustainable practice of agricultural production and poses numerous threats to the ecosystem. Because of the ignorance and conservativeness of the peasant farmers, it is seen as the easiest and cheapest method of land clearance. The consequences are mostly unknown by these farmers or not considered. Despite its adverse effects, the practice has persisted in tropical Africa. The paper gave insights into the impact of bush burning on the growth and sustainability of agriculture. Meanwhile, it seems complicated to stop, but it should be minimised, re-jigged, and reinvented.

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